The Automobile

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34 H. P. Added

Without Adding Size or Cylinders in the

HUDSON SUPER SIX TRADE NAME REG.

$1375 at Detroit

Patented by Hudson
December 28, 1915
Patent No. 1165861

Hudson Super-Six

Wasted Power Now Reserve Power

THE Super-Six motor has identical size with the former Hudson Light Six.

But the former type, at its best, delivered about 42 horsepower. The Super-Six delivers 76 h.p.

No more power is created, no more fuel is consumed. All that added power—that extra 80 per cent—is power that was lost in friction. And that friction was due to vibration.

THE IDEA IS NEW

The Super-Six motor follows standard practice in all respects save one. But that one new feature, by eliminating vibration, gives us 70 per cent more efficiency.

The idea is new—a basic invention—as proved by the fact of our patent. It is also proved by performance. The Super-Six has broken all the stock car records.

It has outrivaled every former type — Sixes, Eights and Twelves.

And this new motor is a Hudson invention, controlled by Hudson patents. So it gives to the Hudson unquestioned supremacy.

Reason for 76 H. P.

In the light-weight Hudson this 76 horsepower means a vast reserve power.

It means effortless performance on any road or hill. It means quick acceleration, matchless flexibility.

It means economy, for the motor rarely runs at more than half its capacity.

It is not added power, remember. It is power that we save by saving vibration—power that was heretofore wasted.

LITTLE ENGINE WEAR

All this extra power—this 80 per cent—means that much lessened friction. Engine wear has been almost eliminated.

In our speedway tests a Super-Six stock motor was run for 1350 miles at speed exceeding 70 miles per hour. It was the hardest test a stock car ever stood. But not a part or bearing showed any discoverable wear.

The motor's endurance has been almost doubled by this Super-Six invention.

Take a ride in the Super-Six. Put it through its paces. Then you will realize that fine-car buyers are bound to demand this efficiency.

7-Passenger Phaeton, $1375 at Detroit.

Five Other Styles of Bodies

HUDSON MOTOR CAR COMPANY
Detroit, Michigan

All Other Cars Outrivaled

At Sheepshead Bay, under A. A. A. supervision, a 7-passenger Super-Six stock car excelled all former stock cars in these tests.

100 miles in 80 min. 21.4 sec., averaging ***74.67 miles per hour***, with driver and passenger.

75.69 miles in one hour, with driver and passenger.

Standing start to 50 miles an hour in 16.2 sec.

During these tests the car was driven 1350 miles at top capacity, at speed exceeding 70 miles per hour without discoverable wear on any part.

95% of all Car Manufacturers have

Chosen the Stewart Magnetic Type Speedometer for their entire output. Over 1,700,000 in daily use on cars. Special equipment for the

Ford
Saxon
Chevrolet

Complete, ready to install

$10

Stewart MAGNETIC TYPE Speedometer

Stewart-Warner Speedometer Corporation, Chicago, U. S. A.

VOL. XXXIV NEW YORK—THURSDAY, MARCH 9, 1916—CHICAGO NO. 10

The AUTOMOBILE

Wanted, $100,000,000 Worth

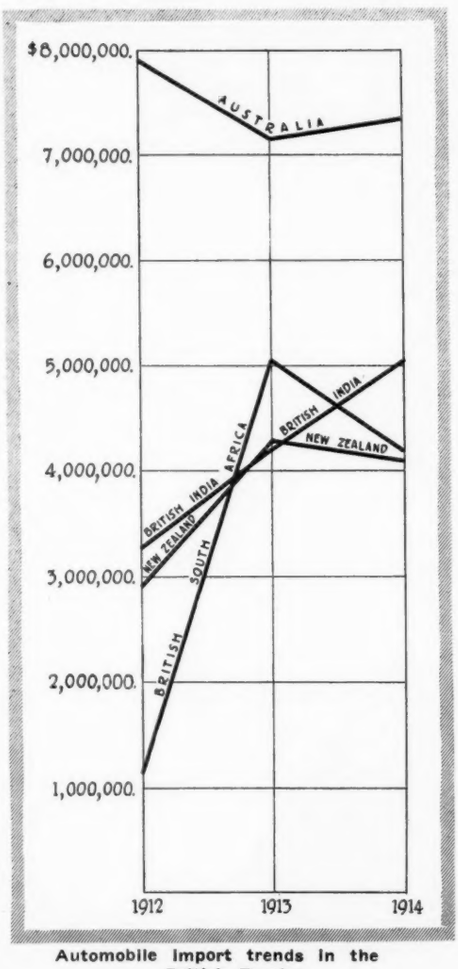
The British Empire Needs Vast Numbers of Cars and Trucks Which Can Come Only from America

By A. Ludlow Clayden

FOR the past several years American made cars and trucks have been exported in increasing numbers to the outlying parts of the British Empire. Australia, New Zealand, South Africa, India and the lesser portions of that vast territory, have looked to England for the major portion of their vehicles, but the eminent suitability of the American car to countries constituted much like America, has earned for it a growing popularity.

Canada is outside the argument, for Canada is a market which the American manufacturer enters without thinking about it; so in the following analysis of British Empire markets, Canada is left entirely out of the calculations.

The immediate conclusion, born of a close study of the import statistics of the major British colonies, is that Australia, New Zealand and South Africa, together with India, will want to buy $100,000,000 worth of automobiles during the next two years. These colonies are not feeling any pinch of war; on the contrary they are supplying many needs of the mother country and being paid for them in hard cash; the modern or reawakened patriotism of the Briton is a distinctly profitable thing to the Empire as a whole. Thus the colonies not merely want American cars, but have ample ready cash to pay for them.



Automobile import trends in the British Empire

It has been generally understood that many American manufacturers have been doing a good trade with British colonies these past twelve months, but it needs figures to show how great is the actual opportunity for immediate sales and future business.

Take Australia first, as being about the largest buyer of automobiles among the newer countries of the world. Unfortunately it is not possible to give statistics for 1915, as there has not yet been time for the compilation of the figures and their transmission to America, but sufficient is shown by study of the returns for previous years to indicate the trend of affairs. Taking the graph on this page, we see the automobile imports of the four major British colonies for 1912, 1913 and 1914 have shown a steady and substantial increase; moreover it shows

that the American imports have risen very considerably in value.

However, it is not so much the value of the imports from the different countries that matters so much as the total values. Studying the curves of total importation, although we have only three points on each, it is yet self-evident that each of these four countries is absorbing automobiles at a rapidly increasing rate. It is safe to assume that the demand for cars in Australia, in New Zealand, in South Africa and in India is progressing in a normal way. None of these countries is pinched by war, and the extent to which taxation has risen is offset by the increase in the demand from Europe for their products.

Thus if we carry on the curves for another couple of years through 1915 and 1916 up into 1917 it is obvious at once that there will be a very large market indeed for cars and trucks and a very strong demand.

In 1914 the British colonies imported a total value of automobiles of roughly $30,000,000. Of this total the United States supplied only between $7,000,000 and $8,000,000. The balance of very well over $20,000,000 came mainly from England and France, with a fair amount from Italy, Belgium and Germany.

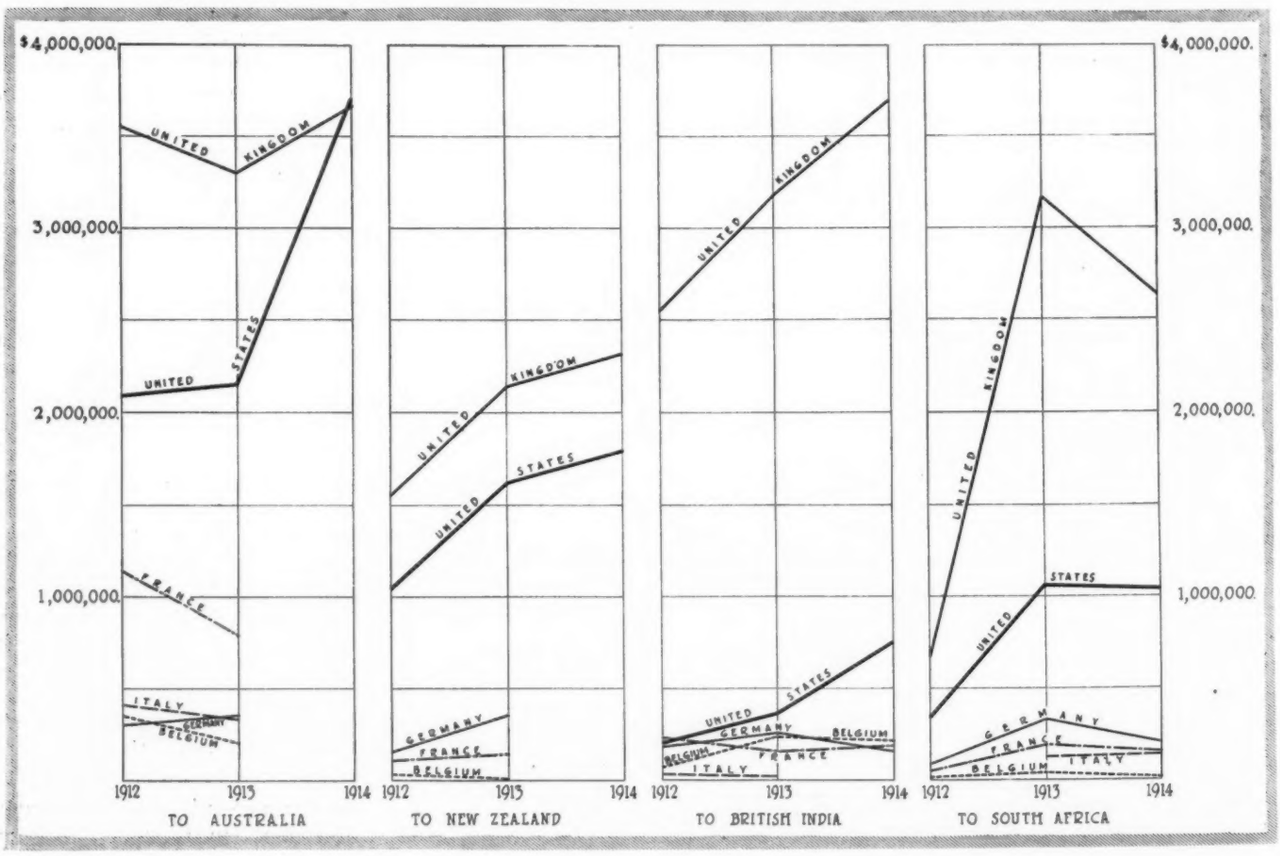
Exports of Motor Vehicles, Motor Cycles and Accessories —In American Dollars

From	To Australia 1912	1913	1914	To New Zealand 1912	1913	1914
United States	$2,088,225	$2,123,321	$3,695,595	$1,045,000	$1,620,000	$1,789,951
United Kingdom	3,545,268	3,308,956	3,663,600	1,560,000	2,145,000	2,325,900
Germany	332,142	366,645	.....	157,000	355,000	.....
Belgium	360,948	220,248	.....	24,000	5,000	.....
France	1,145,526	779,458	.....	120,000	131,200	.....
Italy	430,980	359,936	.....	.....	.....	.....
Total	$7,903,089	$7,158,564	$7,359,195	$2,906,000	$4,256,000	$4,115,851

From	To British India 1912	1913	1914	To South Africa (‡British) 1912	1913	1914
United States	$201,000	$365,500	$752,698	$348,300	$1,167,371	$1,045,000
United Kingdom	2,560,000	3,185,000	3,699,917	670,800	3,180,000	2,630,000
Germany	195,000	260,000	167,802	77,400	330,000	205,000
Belgium	79,500	240,000	220,959	12,900	35,027	9,510
France	220,500	165,000	195,181	51,600	195,300	154,500
Italy	25,100	13,500	.....	.....	121,000	139,932
Total	$3,281,100	$4,229,000	$5,036,559	$1,161,000	$5,028,698	$4,183,942

‡Figures are for year ending Dec. 31, 1914, which, because it includes 6 months of the war slump period, no doubt accounts for the decrease shown all down this one line. Note that U. S. exports show an increase to each country for 1914, except South Africa, which is not the case in regard to the exports from the other countries.

Curves Showing Trends in Importation from America, United Kingdom, France, Italy, Belgium and Germany from 1911 to 1914



Despite the war the British colonies are all in a state of fair prosperity. Every year for the past five the total imports to Australia, South Africa, New Zealand and India have increased with the exception of South Africa, which showed a slight drop in 1914. Probably this was because South Africa had some actual fighting to do in its own territory.

On the whole it is reasonable to assume that the upward trend has been maintained through 1915, judging by individual reports we have published. Assume the upward curve to be persisting and the four principal parts of the British Empire (excepting Canada) would have wanted about forty million dollars worth of automobiles in 1916. Of these, thirty millions would come from Europe in normal times. At present Europe cannot supply a single vehicle.

$30,000,000 This Year

This means that, if they can seize the chance offered, American automobile manufacturers have a market for a minimum of $30,000,000 worth of goods this year in four countries, all easily reached from our ports without going near any war zone.

Nor is it for this year only, for, if the war should end to-morrow, it will be two good years and more before the factories of Europe are again ready for exportation in any substantial quantity.

Then again, in 1913 the total value of German exports to the four parts of the British Empire which we are considering was $1,311,645, and the total figures for the first half of 1914 show that there would have been a substantial increase if the war had not intervened. Germany will have to wait many years before these markets are open again. Italy is not an important factor, and the French imports show a general decline. This means that Great Britain and America are left alone, almost, to struggle for the rich markets of the Empire.

America's Help Essential

Nor is it really a question of struggling. Great Britain, unless her methods of manufacture undergo a vast change, will be totally unable to supply the needs of the overseas parts of her dominions. The demand for passenger cars and trucks in England itself to-day keeps the importers busy, and, when the war is over and the British factories are once more producing automobiles, the domestic demand will easily absorb all the output. No doubt the importation of American cars into England will receive a check at the end of the war, as the feeling is very strong that Great Britain ought to do everything to keep her money within her own boundaries, but the more of her own output that England takes, the less will she have for export purposes.

This being so the American manufacturer is the only one left who can possibly satisfy the needs of Australia, South Africa, New Zealand and India, for the next five years or more, and probably longer.

The possibilities of the British Empire as an automobile market are staggering in their immensity. The enormous areas and the immense population provide an ever-increasing outlet for every possible sort of machinery.

Taking the Indian Empire alone, its 2,000,000 square miles with over 300,000,000 inhabitants represents an area of fairly dense population and with far from good means of transportation. Certainly, of that 300,000,000 the vast majority is semi-savage, but fully civilized or half civilized, there are many millions who spend their time in going to and fro just as in more fully developed Western lands. For the truck and omnibus as well as for the passenger car India offers a field almost as big as the U. S. A., which will develop slowly year by year for a century ahead.

Unexploited Fields

In Australia, New Zealand and South Africa, much of the land is yet unbroken, is trackless and railroadless, but the kerosene tractor, and the automobile plow, are wanted to convert the wild land for cultivation; and then the motor truck will come to haul the produce to rail or river head. Countries developed a century ago were essentially railroad countries, but those which are just being opened up to-day will be automobile countries first, because a practicable road for automobiles is a far cheaper thing to build than a rail track.

There is no river in the world where the chug-chug of the motor boat cannot be heard, there are few cities where the motor car is not being used in the great work of expanding and extending civilization. Great roads cut through the forests of Africa may be a vision of the future, but it is a less far distant future than most men would imagine.

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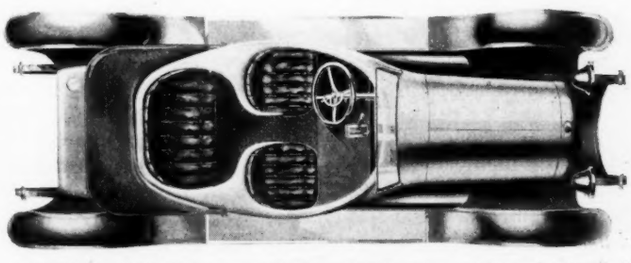
Overland Adds Clover Leaf Body Type

THE six-cylinder Overland, model 86, can now be obtained in limited quantities with a clover leaf body to seat three or four passengers. The car will sell for $1,290 f.o.b. New York, and the chassis is identical with the standard six Overland except that the gasoline tank is at the rear, on the deck and with the filling cap at the side.

The new body will be finished in four colors, gray, green, red or blue, the wheels being a suitable contrasting tint, except for the vermillion car, which has wheels in the same paint as the rest of the body.

The Ohio Electric Car Co., Toledo, Ohio, are the manufacturers of the body, and the procedure for buying one of these cars is to order the chassis from the Overland Co., with instructions to deliver to the Ohio Electric Car Co., who will receive separate payment from the dealer ordering the car.



Overland Model 86 size cylinder chassis with clover leaf body equipment

The Sizes of Motors for Trucks and Outline of British Practice in This Field

An Exposition Covering Especially Those Features in the Design of Automobile Motors Which Should Vary According to the Different Conditions of Vehicle Service

By W. D. Williamson

Extracted from a paper entitled "Engines for Petrol Commercial Vehicles" presented by Mr. Williamson to the British Institution of Automobile Engineers. In the review of practice, forming a part of this paper, only motors for vehicles having a useful load capacity of two tons and upwards are considered, so as to exclude design which is artificially influenced by taxation based upon the bore of cylinders.

Part 1—Factors Governing the Sizes of Motors

THE designer of pleasure cars, after doing all he can to obtain the maximum of torque from a given cylinder, devotes his energies to the pursuit of "revolutions." To him, and to the aeronautical engineer, horsepower for weight is a serious consideration. In motors for commercial vehicles, on the other hand, the design is unhampered in this respect, in so far as additional weight is not of great moment, except in reciprocating parts, if it serves a useful purpose. Utility and manufacturing cost are the guiding considerations, and the designer can set out to produce a motor which will give the best possible results, in the hands of the average user, under the conditions for which it is intended.

Requirements in General

The user demands a vehicle with high fuel economy per ton-mile and reasonable speed. The motor must be robust, to insure against breakdowns, and the parts must be accessible, to facilitate adjustments and replacements. Here bore and weight are not involved. The user is often favorably impressed if the cylinder bore is, for example, ⅛ in. larger than in a competing vehicle.

Silence of operation has not so far been an outstanding feature or indispensable for the success of commercial vehicles. Motor noises were drowned in the general uproar. But live axles, inclosed chains and quiet gear boxes are bringing about a change. Motor buses and char-a-bancs set the fashion. The quietness of one portion of the chassis throws the noise from another into prominence. In one after another the noise is remedied, and finally the demand for a quiet motor, too, makes itself heard. To-day, on fair roads, high-class lorries operate with a lack of fussiness undreamed of a few years ago.

The motor must be produced at a competitive price. This requirement is related to those already mentioned, in so far as a low production cost for the motor enables a manufacturer to meet competition by putting all or a part of what he saves on the motor into improvements or workmanship that will tend to maintain his prestige.

The design must be adaptable to variations in size. As few British builders of commercial vehicles confine themselves exclusively to one type or size of chassis but usually cover load capacities from two to five tons and sometimes one or two sizes for passenger work, they have to provide a suitable range of motors, and from a manufacturing point of view it is highly desirable to obtain this range or series of motors with the fewest possible changes. The engines may be grouped so that one size is made suitable for two or three different types of vehicles, and provision can be made in some cases for larger cylinders and pistons to be used in conjunction with standard crankcases where additional power is required. The methods for attaching the motors to the frame can be standardized, so that it becomes possible to fit, for example, either a 30-hp. or a 40-hp. motor in the same frame without too many alterations. A little forethought in this direction may mean advantages both to himself and to the user.

Determining the Size of Motor

Motor speed and road speed are the most important factors for determining what the size of the motor should be. The ratio between them must be decided, and, in order to do so, the most economical motor speed must be discovered, as well as the average road speed giving the best vehicle results.

In ordinary delivery work for loads of two to four tons, a very satisfactory maximum speed is 15 m.p.h. For loads of four to five tons, this should be reduced to 10 or 12 m.p.h. For passenger vehicles greater speed is frequently demanded, and their hill-climbing speed must be better than that of a lorry or van, so that their motors must be correspondingly larger, but for commercial vehicles in general the figures mentioned may be taken as normal.

The best motor speed for these vehicle speeds depends largely on the type of engine used. Hence the type of the engine must be considered first. Broadly, it is found that the high-speed and high-compression motor so largely used for pleasure cars does not suit. Such a motor in a pleasure car is rarely required to run at low speeds with full throttle opening, and then usually only for short periods. In other words, in its average use the volumetric efficiency is low, its compression is reduced by throttle restriction and its rate of revolution is considerably below the maximum. Motors of this type are also apt to require more attention to minor points than the commercial vehicle motor obtains. While it is desirable to fit an engine no larger than the work requires, the weight consideration, which is mostly responsible for the pleasure car type of motor, should give way to those related to length of life and reliability.

One of the principal points in determining the most suitable type is to ascertain the motor speed at which the best results are obtained for the gasoline consumed. And, with the vehicle speed decided upon, this means the motor speed which will drive the vehicle at the selected road speed with the minimum of fuel cost, unless other factors cause a modification in this. In other words, the desirable speed for any particular motor must be determined through comparison and consideration of its torque and consumption curves.

Characteristic Torque Curves

The diagram of curves taken from a Dorman motor and shown in Fig. 1 illustrates the points to be considered. In

examining this torque curve it is seen that from the lowest speed at which regular torque is obtained—about 300 r.p.m.—there is a rise showing increased load on the piston. The effective torque of the motor depends upon volumetric efficiency, cooling, carburetion, internal mechanical loss and on the relative gains and losses due to these governing factors at various speeds.

The volumetric efficiency should be greatest at the lowest speed at which the engine will run steadily, as under such conditions the cylinder should receive a full charge of mixture. At this speed, however, the cooling effect is most pronounced. The working temperature of the whole engine is lower; the heat losses during the cycle are considerably greater than at high speeds, and the thermal efficiency of the engine suffers. Carburetion at this speed with the usual carbureter setting would probably not be as perfect as at higher speeds.

Mechanical loss per stroke or per cycle where lubrication is thorough, might be expected to decrease with increased speed, if the actual loss due to friction alone is taken into account. In addition to this, however, the engine is called upon to overcome the valve spring pressure and valve inertia, and to drive the fan, water pump and magneto. The loss due to these increases more rapidly than the gain due to decreased friction, so that there is a probability of a greater total mechanical loss at high speeds.

It might be suggested that by suitable carbureter setting and by modification of the cooling arrangement the thermal losses at low speeds could be reduced, and the engine made to give an excellent torque at this speed. This is, no doubt, quite true, but the object is not to endeavor to alter the conditions to make the engine produce good results at any particular speed, but rather to find out at what speed the engine gives the best all round results for our purpose.

Tracing the torque curve through its rising speed the maximum is approached at about 700 r.p.m., and the curve remains fairly flat from there to 1000 revolutions, where it commences to fall.

Up to 700 r.p.m. the power of the engine per cycle is evidently increasing. The volumetric efficiency may be decreasing, the mechanical losses probably increasing, but these are evidently more than balanced by the increase in thermal efficiency and the more perfect mixing of the charge.

From 700 to 1100 r.p.m. the gains and losses are evidently almost balanced, as there is little variation in torque between those speeds, but as the speed increases, restrictions due to the valves and pipes begin to have their effect. Volumetric efficiency probably falls off and mechanical losses increase, and the net result is a decreased torque.

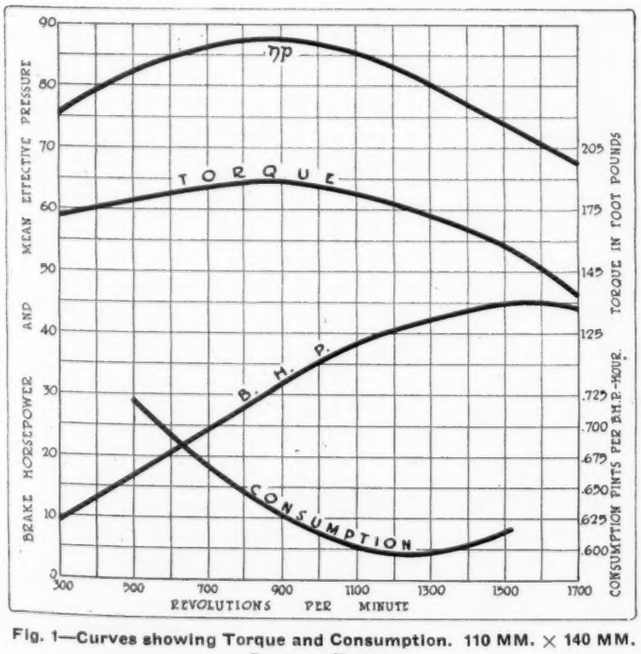


Fig. 1—Curves showing Torque and Consumption. 110 MM. × 140 MM. Dorman Engine

Consumption Curves

Considerations of torque alone would lead to the conclusion that unless the valve and pipe diameters are increased the engine is likely to give the best results if its range of revolutions is kept between 700 and 1100 r.p.m. Before any definite conclusion can be arrived at, however, it is necessary to go into the cost of this torque. The object in a commercial vehicle engine is to obtain torque for the least possible expenditure of gasoline, the ideal being attained when the range of maximum torque coincides with the speeds for minimum consumption—a result which is rarely obtained. While the consumption curve must depend on the carbureter setting for its actual value and relationship to the torque curve, it is generally found that the range of minimum consumption is at a higher rate of revolutions than that of maximum torque. When this range is confined to within 15 per cent of the best consumption, the curve shown would give from about 700 to 1300 r.p.m. as the correct range of speeds.

At 1300 r.p.m. the torque is falling, and although the torque per foot-pound is costing no more, since the consumption is at its best, yet the best range of mechanical efficiency is being departed from. If the maximum engine speed is taken at a point far down on the descent of the torque curve, the resulting torque is only equivalent to what might be obtained from a smaller engine at a lower speed. There appears to be no objection to allowing the maximum speed to be located some little distance down the curve, as on meeting increased tractive resistance the reduction in engine speed to come within the range of maximum torque would not be great. This maximum speed might then be taken at 1300 r.p.m.

An examination of the curves on these lines would lead to the conclusion that the maximum engine speed would be governed by the torque curve, and the minimum speed by the consumption curve.

If the left-hand end of the curves be considered, it is found that from 700 to 500 r.p.m. the torque value is moderately high, but the consumption curve shows that this torque is only obtained at a very expensive rate.

Take the case of a vehicle under load ascending a hill which eventually causes a change to a lower gear. As the tractive effort increases the engine speed falls from its maximum to a speed at which a higher torque value is obtained, and this continues until, with the driver's well-known persistence in hanging on to the top gear as long as possible, the engine speed has fallen back to below 700 r.p.m., and the engine is running outside its range of economical working.

High torque at this low speed end of the torque curve is therefore not an advantage unless it is accompanied by reasonable fuel efficiency.

Number of Cylinders

The four-cylinder engine appears to have become firmly established for commercial work, and can be taken as standard for the vehicles under consideration. The only heavy vehicles having engines of more than four cylinders are for fire engine or other special purposes.

Calculations for Engine Size

The usual ratio of engine to road speed in modern vehicles is for 1000 r.p.m. to correspond to about 15 m.p.h., but for any engine with curves corresponding to Fig. 1 there is a decided advantage in increasing the engine speed to 1300 r.p.m. Not only is the consumption improved, but the increased speed allows a decrease in engine size for any given weight of vehicle, with a corresponding lightening of transmission parts up to but not including the final drive. For the engine

under consideration it is proposed to assume 1300 engine revolutions per minute for 15 m.p.h. The next step is to arrive at some formula to give the actual figures for engine sizes to meet particular requirements.

In the following method the author has aimed at obtaining a formula that is easy to handle rather than one which will give accuracy to a large number of decimal places.

The useful work obtained from the engine per minute is represented in foot-pounds by:

Mean effective brake pressure × area of cylinder in square inches × stroke in feet × number of working strokes.

Let V represent volume of one cylinder in cubic inches,
D the diameter of cylinder in inches,
S the stroke in inches, and
N the revolutions per minute.

and if r is taken as $\frac{\text{stroke}}{\text{bore}}$, then stroke $= r\,D$ and the useful work obtained per minute is:

$$\eta p \times \frac{\pi D^2}{4} \times \frac{r\,D}{12} \times 2\,N$$

(In which ηp represents, as usual, *M.E.P.* multiplied by the percentage of mechanical efficiency.)

or

$$\eta p \times \frac{\pi\, r\, D^3}{4} \times \frac{N}{6} \text{ foot-pound}$$

but

$$\frac{\pi\, r\, D^3}{4} = \text{Volume of one cylinder,}$$

and therefore $\eta p \times \frac{N}{6} \times V =$ foot-pound per minute.

The Factor "Q"

The work this engine has to perform is to propel the vehicle against the internal friction of the vehicle itself, the external resistance due to the road and the wind pressure.

Let S represent the speed of vehicle in miles per hour.
W the gross weight of vehicle in tons.
R the total resistance on the level in pounds per ton.

Then the total foot-pound of work per minute required by the vehicle on the level is:

$$W \times R \times S \times \frac{5280}{60}$$

Hence, for an engine just large enough to drive any vehicle of gross weight W on a level road:

$$\eta p \times \frac{N}{6} \times V = W \times R \times S \times \frac{5280}{60}$$

Taking ηp at 80 lb. from Fig. 1, and R at 71.5 from Fig. 2, with 15 m.p.h. at 1300 r.p.m. we get:

$$80 \times \frac{1300}{6} \times V = W \times 71.5 \times 15 \times \frac{5280}{60}$$

or $$V = W \times \frac{71.5 \times 15 \times 1760 \times 3 \times 6}{60 \times 80 \times 1300}$$

or $V = 5.5\ W$ approximately

That is to say, the cubic capacity of one cylinder of the engine is found by multiplying the gross weight of the vehicle in tons by 5.5. This factor the author has called "Q." In dealing with "Q," it must be remembered that the factor assumes a definite ratio between engine and road speed—in this case 1300 r.p.m. and 15 m.p.h.

An engine designed with a "Q" of 5.5 would not be a commercial success. As long as the vehicle remained on a level road and had a total resistance of 71.5 lb. per ton the engine would be equal to the work required, and would be doing that work under most economical conditions. The drawback is that it has practically no reserve for hill climbing.

Curve 1, on Fig. 2, shows the engine torque taken from Fig. 1, and is plotted to correspond with the figures for road resistance. This shows the engine torque and road resistance cutting each other at 15 m.p.h. On an increasing gradient, as the engine speed falls the torque increases to a maximum at about 1000 r.p.m. and the road resistance decreases. The ability of this vehicle to climb is represented by the distance between the Curve R and Curve No. 1, Fig. 2, but at its maximum is less than 30 lb. per ton, which is the increase in resistance due to a gradient of only 1 in 74.

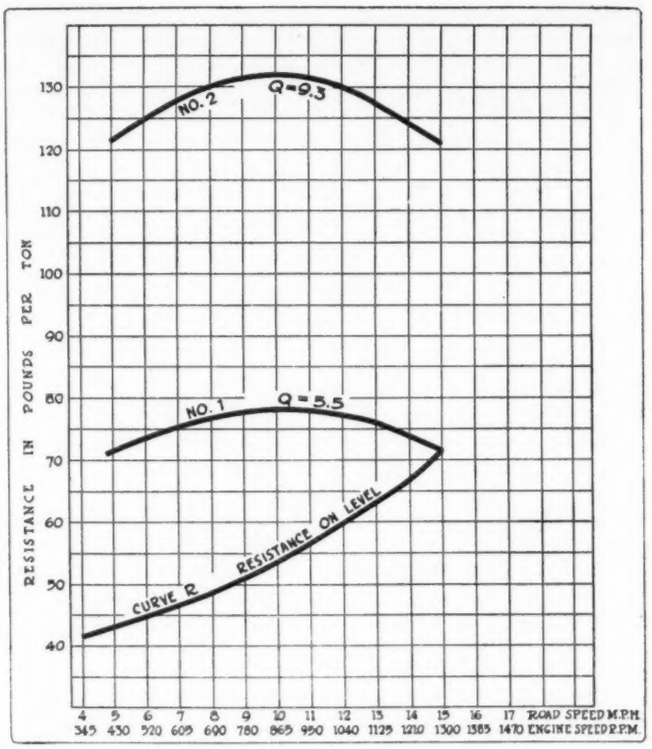


Fig. 2—Curve R is from Mr. Wimper's formula: Resistance = 40 + 14 $\left(\frac{V}{10}\right)^2$ lb. per ton where V is speed in M.P.H.

The maximum gradient up which the engine would drive the vehicle on top gear is represented by Curve 1 in Fig. 3.

Engine Sizes for Hill Climbing

The modern lorry is expected to be able to climb gradients of about 1 in 30 on top speed with full load, and we may take this to be a reasonable figure. From Fig. 1 it is found that the engine has its range of highest torque at about 1000 r.p.m. or 11½ m.p.h., and this is taken as the climbing speed.

ηp is 87 lb. and R is 58.5.

The total resistance due to R and the incline is

$$W\left(R + \frac{2240}{30}\right)$$

or

$$W\left(\frac{1755 + 2240}{30}\right)$$

$= W\frac{3995}{30}$ (approximate total resistance = 133 lb. per ton)

(*Continued on page* 476.)

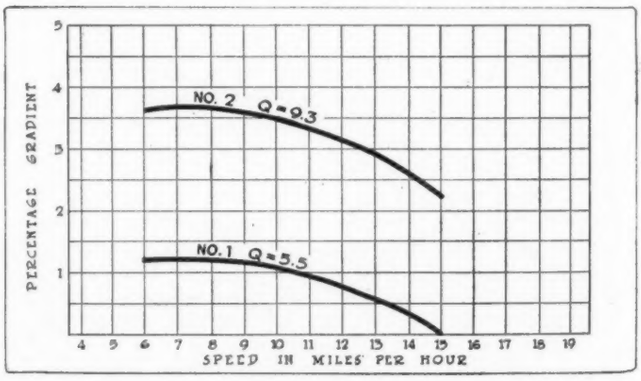


Fig. 3—Hill climbing capacity for "Q" = 5.5 compared with same for "Q" = 9.3

Proving New England Prosperity

Boston Show Discloses Demand Equal to Expectations—Buying Active Throughout Winter — Many Closed Cars Wanted

By David Beecroft

BOSTON, March 7—Last week THE AUTOMOBILE stated that 1916 would be one of the most prosperous years for the automobile in New England. This week, after spending two days at the fourteenth annual automobile show now running in this city, we are led to confirm the fact, not because of crowded exhibits and aisles in the show, but because we have talked with a majority of the Boston distributors who handle New England through scores of agents, and because we have seen the Boston populace and the New England populace look over cars and buy them. Only two days of the show have passed. Five more remain, and the story that could be written if the complete history of the business of show week could be accurately collected would be one of the most impressive automobile stories that New England ever heard. The out-of-town dealer tells the same story that the Boston distributor tells, a story of unprecedented demand for cars, a story of unparalleled wealth through the six States, and a story of greater confidence than heretofore experienced.

Last week the prediction was made that New England could absorb 50,000 cars this year. She can readily do this if the cars can be secured, if shortage in materials does not restrict production in many factories not fortified against the days that seem in store in the metal world. If New England can get the cars when the buyers want them she can absorb 60,000 machines; in fact, the demand is here for 75,000 machines.

The possible shortage of material has permeated the farthest town in Maine, in New Hampshire, in Vermont as well as the three southerly States, Massachusetts, Rhode Island and Connecticut. New England is much closer to the metal market than some other parts of the world—closer than the great Mississippi Valley with its almost limitless areas of productive acres. New England has breathed machinery for years and knows of the rising prices of metals and the possibility, grave possibility, of not being able to perhaps secure as many cars a few months hence as she would like to receive. New England remembers the past season when, if more cars could have been had, much more money would have been made.

This combination of circumstances has brought about an entire change in conditions throughout the six States and particularly through the three northern States, Maine, New Hampshire and Vermont. Never before has there been such a generous and widespread storing of cars by dealers in these States during the winter months. Heretofore the New England dealer was adamant to all solicitations of the maker and the distributor to store cars and have them ready for spring delivery. To-day he is stocking up in an unheard-of manner, and apparently for varied reasons. He knows the money is in his territory to buy cars, he knows that the material market is rising and he feels in his very bones there is grave probability of a car shortage when the big selling season comes. He wants to be protected at that time. He has turned over a new leaf in automobile selling. The arguments that manufacturers have been hurling at him year after year have at last fallen in fertile soil. The old New England tradition appears broken. A new order has set in.

The Boston distributor has come to the dealers' assistance in this storing work by making the storing process as easy financially as possible. Often the dealer has to give a deposit of but $100 per car, and in addition pay interest on the money the dealer has invested in it and carry the insurance, if he takes such protection, which the distributor generally requires. This proposition, attractive as it is, lacked appeal a year ago. To-day it is a potential.

The used-car market has experienced a desirable stimulation. It is perceptibly better than a year ago, notwithstanding the fact that many distributors in Boston are stocked up with far too many cars taken in in trades. To-day these distributors, some of them dealers, hope to find a ready

Invention, Progress, Industry and Success uphold the giant wheel

market, due to a possible lack of new cars. Already this is having its effect, and were it not for the heavy snow generally throughout the six States which has been on the ground for the past two weeks, the used-car business would be moving at a very healthy rate to-day. New England freezes up in buying automobiles much in proportion to the temperature and snow condition. Hundreds of sales have been delayed by the snow. Opening conditions are looked for and anticipations are for the biggest March and April of years. Some predict a very short active selling season. They go so far as to say that by May 15 the selling season will be over. Definite reasons for such an opinion are wanting. The answer seems to be in the atmosphere.

Carload Shipments All Winter Through

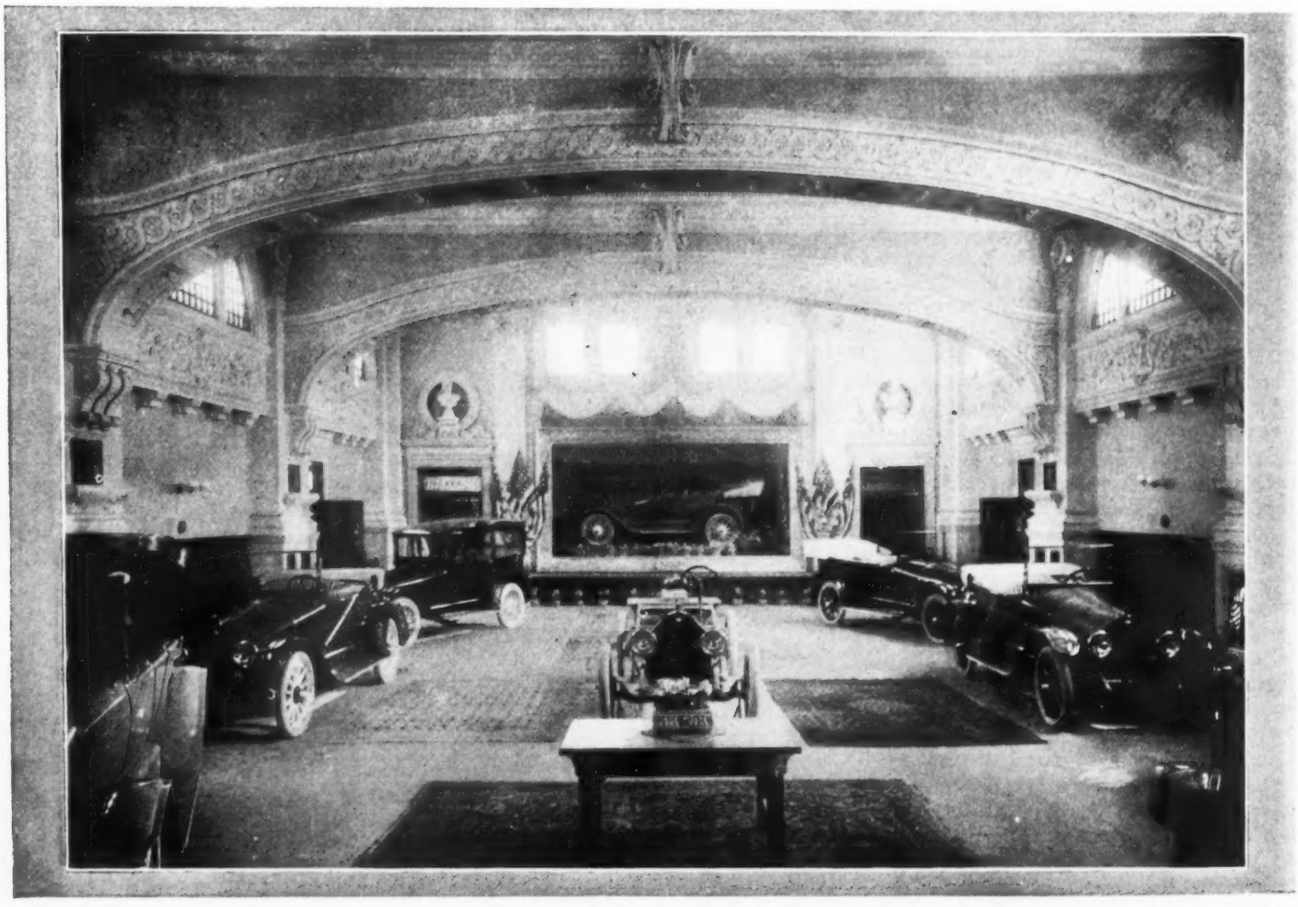
Reverting to the question of winter deliveries to dealers throughout all New England: Carload shipments have been made to the several States all winter, a condition not existing heretofore. A Maine dealer recently placed an order for fifty cars. In Vermont such centers as Rutland, Burlington, St. Johnsbury and Barre have been taking deliveries constantly. There is a tendency in these cities to keep cars more in commission than formerly, but only a very small percentage of the sales are going into actual use. Dealers in these cities are making deliveries, although the ultimate purchaser is perhaps not putting the car into commission. He is taking time by the forelock. He wants to know that he will have the car, and that new turns in the war, new developments in Washington, or other unexpected conditions such as shortage of materials, shortage of cars, etc., cannot rob him of his machine.

Reverting to the Boston show: The show is revealing many changes in the general trend of the industry in the six States. Closed cars are making very pronounced headway, this not only in Boston, but in all the States. The progress is slow in such Vermont centers as Burlington, Rutland, Montpelier and Barre, where very few cars are seen on the streets in the winter. The cities in Maine along the Atlantic Coast enjoy a climate moderated by the salt waters of the ocean and so can use their cars to advantage all winter, while those cities farther inland have to lay them up because of heavy snow falls and cold weather.

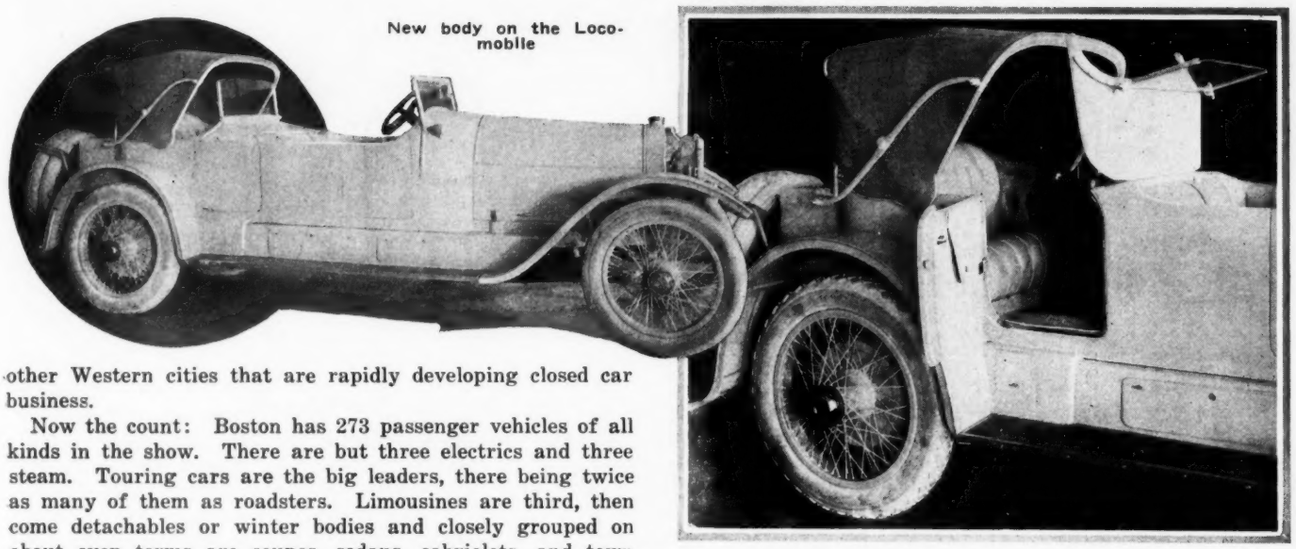
The sedan is proving a popular New England car, not only in Boston, but outside as well. It is the ideal family car. The same is true of the detachable winter body. Coupes are not in demand. The conventional coupe accommodates three people, and for a winter vehicle that is not enough. There must be accommodation for four. Boston is a good limousine town. The Berline is not known at all.

An official count of the different styles of bodies at the show generally reveals the types of bodies most in demand. This cannot be taken without modification, because to-day the selling period of closed cars is over and naturally touring cars and roadsters are featured. There are more closed cars shown than might be expected because several Boston dealers were not able to get their closed types early in the fall. Instead of getting them in October, they came through in December and then in small quantities.

Many distributors are quite emphatic in their condemnation of manufacturers who disappointed them so seriously in the closed car business. Some of the makers in turn were held up by labor troubles. The net result is that the maker does not start his closed car business early enough. He should lay his program out in May and have them in the dealers' hands in September. This is true for Boston and is equally true for Minneapolis, Kansas City, Omaha and many



Paul Revere Hall, on second floor of Mechanics Building, given over entirely to Mitchell exhibit. At the far end is a real full-sized touring car set in a huge painting of New England scenery



New body on the Locomobile

other Western cities that are rapidly developing closed car business.

Now the count: Boston has 273 passenger vehicles of all kinds in the show. There are but three electrics and three steam. Touring cars are the big leaders, there being twice as many of them as roadsters. Limousines are third, then come detachables or winter bodies and closely grouped on about even terms are coupes, sedans, cabriolets, and town cars.

The figures are: Touring cars 120, roadsters 60, chassis 32, limousines 21, detachables 9, cabriolets 6, town cars 5, coupes 4, sedans 4, landaulettes 2 and berlines 1, and a few miscellaneous types. The three electrics are closed types.

A Fine Truck Display

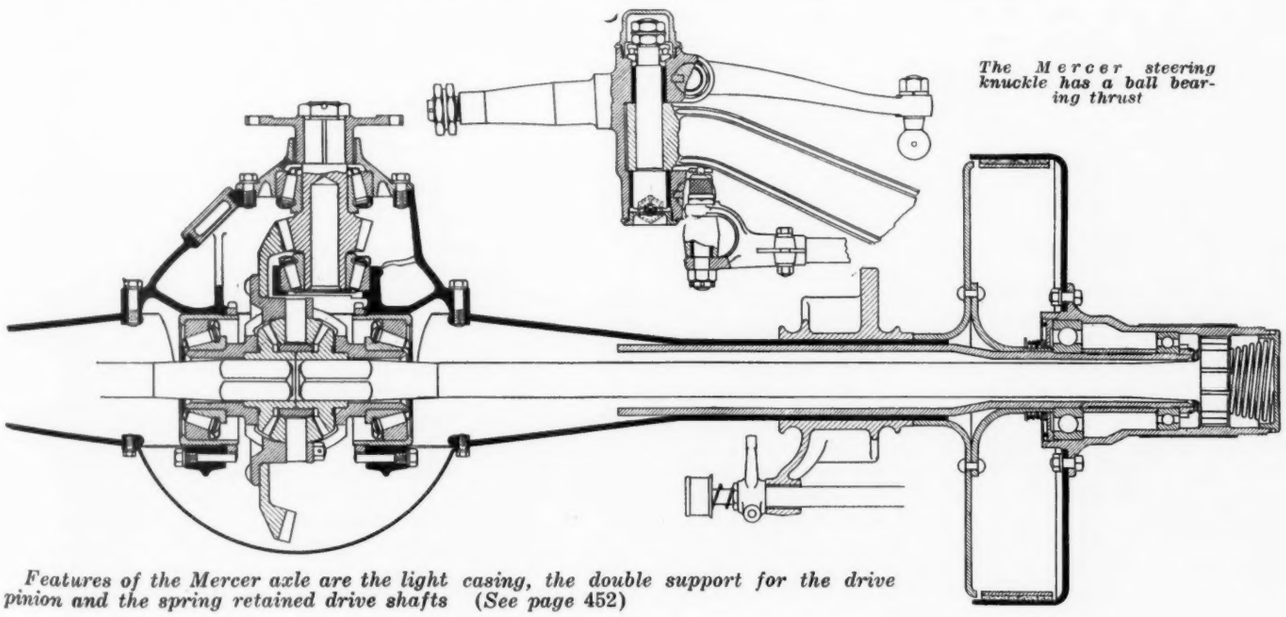
But this is not all. The Boston show has thirty-eight different makes of motor trucks; in fact, the greatest truck show of the year. Never before have there been so many trucks exhibited at a passenger car show. Some years ago Boston had a separate truck show a week after the passenger car show. The attendance was not up to the mark and the separate show was discontinued. To-day there is not room in the basement for the trucks.

The exhibit of electrics is poorer than ever before seen in Boston. There are anly three vehicles. Boston is not a good electric town with its narrow streets and its shopping district boxed up in the heart of the city. Add to this the fact that the city regulations will not permit unattended vehicles standing by the curb more than a certain length of time and you are at once convinced why women have not taken kindly to the electric.

Boston always brings out something new in bodies, styles not seen at either New York or Chicago. Some of these are the creation of local body builders. Others have originated in New England, where there are many high-class body manufacturers. The most original body style seen and one which gives promise of being largely copied is a four-passenger Locomobile touring type with a hinged cowl and windshield for the tonneau. The cowl carries a sloping windshield just as the dash cowl and practically as large. This tonneau cowl hinges to the back of the front seat and is raised when passengers enter. The windshield is back close to the passengers. A victoria top is used. It is the first time this hinged form of cowl and windshield has been seen.

Kissel has a new form of four-passenger roadster with disappearing rear seats. The front seats are individual with a passage between them to the rear, and when the rear seat is folded into the body and out of sight this passage is filled by a hinged filler board. This filler board swings back into the floor when the rear seat is opened. Rear seat passengers sit side by side, and there is comfortable room for two. The body was built by McNear, a local builder.

A high-water mark in exhibit ideas is carried out by the Mitchell distributor, the Pope-Hartford Co. of Boston. The exhibit is staged in Paul Revere Hall, a separate room in the show building, as illustrated opposite.



The Mercer steering knuckle has a ball bearing thrust

Features of the Mercer axle are the light casing, the double support for the drive pinion and the spring retained drive shafts (*See page* 452)

Refinements Feature New Mercers

Two Chassis, Similar Except for Wheelbase, and Four Body Models Continued—The Improvements Made Are Principally in Bodywork

SERIES 22-72 Mercer, which has recently been announced, is a continuation of the line introduced last season with minor refinements. Following Mercer traditions, the series is equipped with four-cylinder motors, and throughout, the new models adhere very closely to their predecessors of the 22-70 line. However, there have been a few refinements during the year.

Four different body styles are marketed this season. They are a six-passenger at $3,000, a four-passenger at $3,000, a runabout at $2,900, and a raceabout at $2,750. This also is in accordance with the practice of last year. The six-passenger touring model is a roomy vehicle adapted to family use, while the four-passenger is a sporting model and is designed for those who want a light car with quick acceleration and speed. Both of these models are mounted on chassis of 132-in. wheelbase.

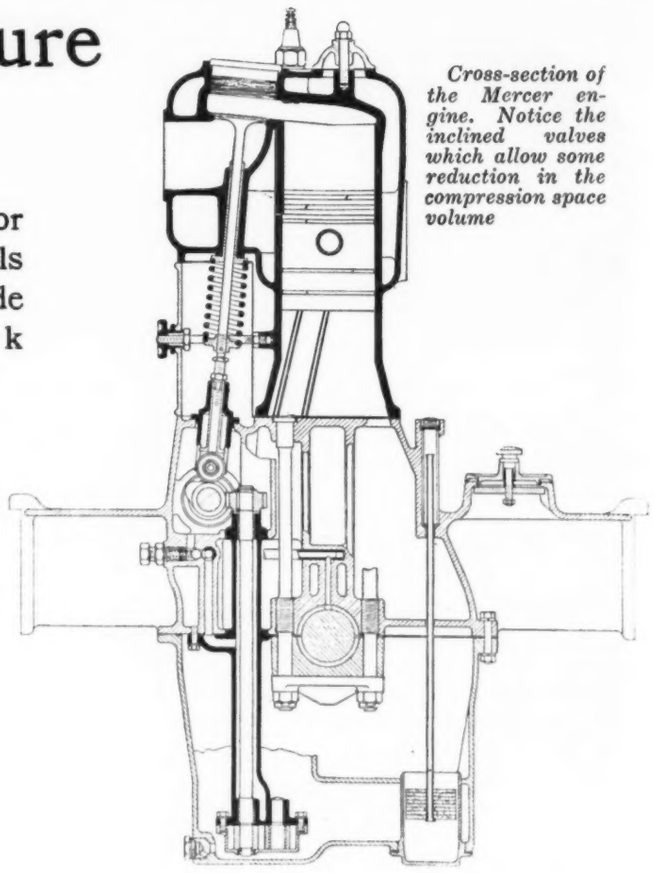
The runabout and raceabout are built on chassis which are similar in practically every particular to the touring chassis, except that the wheelbase is 115 in. The runabout is suitable for two-passenger touring, while the raceabout is confessedly a speed car and is guaranteed to be able to make a mile in 48 sec. or, in other words, to travel at the rate of 75 m.p.h.

The Mercers of last year were distinguished in the touring bodies by the graceful center cowl, and the same idea has again been carried out, but the interior work of the body has been improved considerably. For instance, the auxiliary seat compartment of the six-passenger is finished in black walnut paneling. The extra seats are hidden from view when not in use by doors which can be rolled out of sight similarly to the cover of a roll-top desk, and another convenience is a special compartment built into the right front door to carry a complete set of tools.

Under the center cowl of the sporting model are three separate compartments also covered with black walnut paneling, the center compartment being sufficiently large to carry a good sized suitcase, while the other compartments on either sides are smaller and can be used for carrying such articles as Thermos bottles and miscellaneous items.

Details of Mercer 22-72

Number of Cylinders	Four
Shape	*L Head*
Bore	3¾
Stroke	6¾
S. A. E. Horsepower	22
Magneto	*Bosch*
Carbureter	*Zenith*
Engine Starter	*U. S. L.*
Lighting System	*U. S. L.*
Clutch	*Dry Disk*
Gearset	*Four Speed*
Wheelbase	115
Front Tires	32 *x* 4
Rear Tires	32 *x* 4
Type Rear Axle	*Full Floating*



Cross-section of the Mercer engine. Notice the inclined valves which allow some reduction in the compression space volume

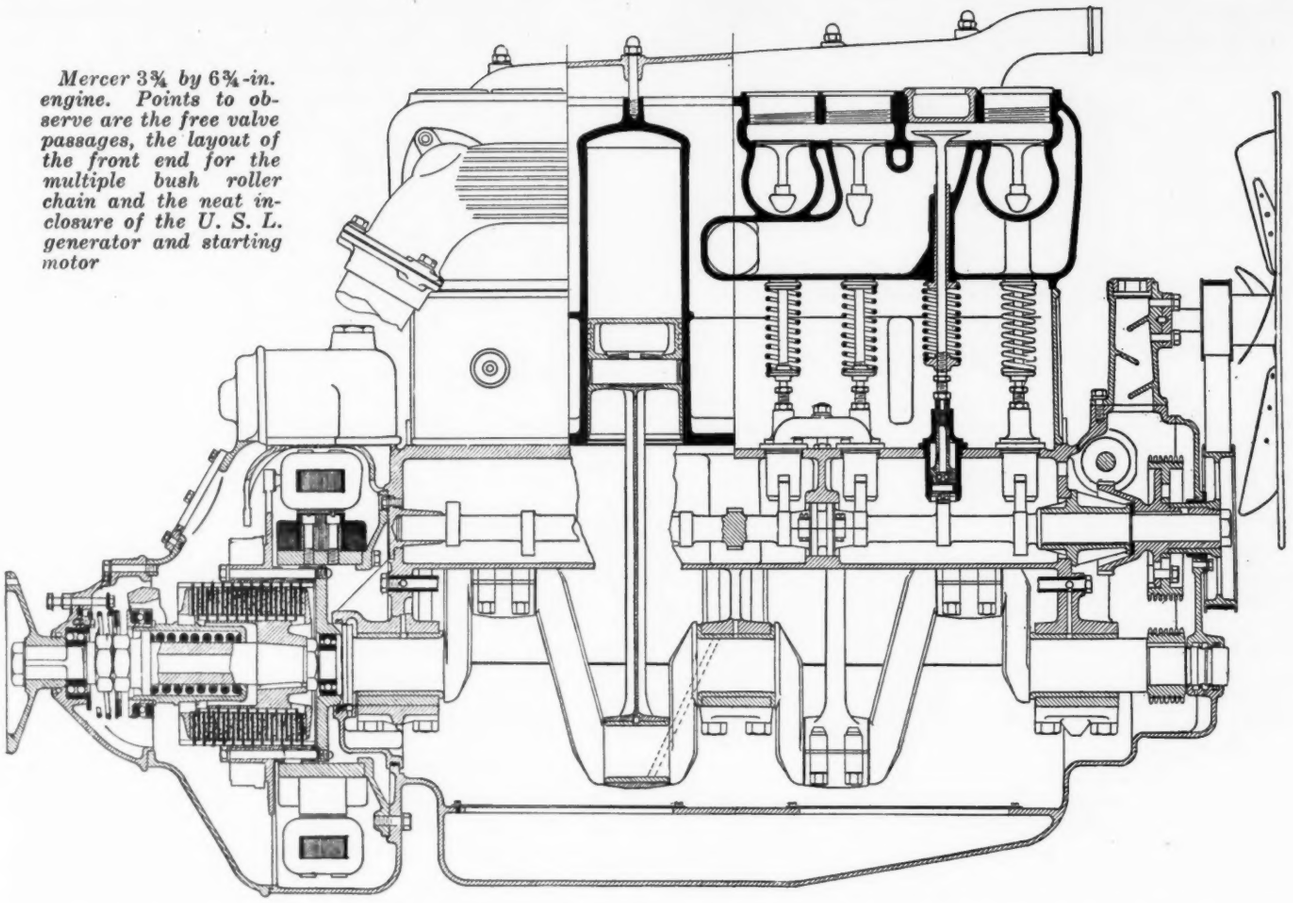
The Mercer car occupies a position in the automobile world that is very nearly unique. It is a car built for a class of buyer that is not very large, and it is thus a machine which has but a few direct competitors. The total number of cars being built in America for this special class of consumer is to be reckoned in hundreds rather than in thousands.

Probably the Mercer is the most European engineering job being made in America to-day, being a high efficiency four of considerable power, capacity for very high speed and a very high accuracy of finish on all parts. In addition it has other features that are considered typically European, such as the powerful transmission foot-brake, the amidships gearbox and last, but far from least, the body lines. In the body the Mercer engineers have made a wonderfully happy combination of American and European ideas. The outside lines are unexcelled by any stock car in the world, the internal fittings combine comfort and convenience to a high degree. It is essentially a British style of body with the best of American and French ideas added to enhance its qualities.

A Really Good Four

It has often been said, and truly, that the four-cylinder engine lacked a proper appreciation because there were so few fours made with the care that is possible in a car demanding a high price. The Mercer engineers, like many others who have not yet shown the courage of their convictions, believe that a four can be made to provide every quality of performance that is necessary or desirable, and have chosen the dimensions of 3¾ by 6¾ in. giving a piston displacement of 298 cu. in.

Since this is not the customary view, it may be well to begin by giving some attention to the performance of the car, before describing it in detail. First, as regards high gear ability, the stock model handles well from speeds of 8 m.p.h. upward, it will run more slowly than 8 m.p.h., but that is the lowest speed that the average driver would use



Mercer 3¾ by 6¾-in. engine. Points to observe are the free valve passages, the layout of the front end for the multiple bush roller chain and the neat inclosure of the U. S. L. generator and starting motor

normally, in fact the change to third gear is so easy that many a man would not employ the high gear for speeds much under 12 m.p.h. This figure of 8 m.p.h. is not a bottom limit as are the 2 m.p.h. speeds possible for some other cars with lower gearing and more cylinders, it is about 2 m.p.h. higher than would ordinarily be obtainable with a six or eight geared to the same ratio.

After 12 m.p.h. is attained it is not possible to distinguish the impulses so as to pick out the engine as being a four, and then, as the speed rises, up to the maximum there is no detectible periodic vibration. Vibration is present of course, but it is extremely small in amount and not perceptible till crankshaft speeds over 2000 r.p.m. are attained. At no speed is the vibration so great as that observable at some speed or another on all but a very select few of the sixes and eights.

Engine Speed Runs High

The speed capabilities of the engine are quite unusual. On second gear on a good road with top up and two passengers the writer obtained 46 m.p.h. and on third gear under the same conditions, 60 m.p.h. On the fourth gear, which is the direct drive, 65 m.p.h. was attained easily, road conditions at the time preventing any greater speed. At 65 m.p.h. the engine is running easily, and evidently the car would touch the 70 mark or a little over.

The gear ratios are, 3.6 to 1 on high; 5.4 to 1 on third; 7.9 to 1 on second and the low speed ratio is 13.8 to 1. This means that at 46 m.p.h. on second the engine is turning at 3800 r.p.m. and at 60 m.p.h. on third it is making 3400, these corresponding to piston speeds of 4270 and 3820 ft. per minute. These figures give an idea of the engine's elasticity and serve to show that the almost total elimination of vibration is a testimonial to the care taken in the design and in the manufacture.

A short time ago the Mercer had a balanced crankshaft, but this has now been discarded, as it is found that the same results are obtained with the conventional type. An idea of the strength is given by the dimensions, the diameter of the main crankshaft journals and crank pins being 2⅛ in. A rather unusual feature of the bearing design is that the front and rear bearings are both the same length, 3⅜ in., the center bearing being 3⅛ in. The 2⅛ in. diameter gives a bearing speed of 556 ft. per minute per thousand revolutions. Since the stroke is 6¾ in. the piston speed at 1000 r.p.m. is 1125 ft. per minute; almost exactly twice the bearing speed.

On high gear the piston displacement is 390 cu. ft. per mile.

Vibration Notably Absent

Returning for a moment to the matter of vibration, since its elmination from the Mercer is one of the car's most striking characteristics, some interesting things have been done to get the good effect obtained. For instance the pistons are Lynite permanent mold aluminum of a lighter section than usual, the webs beneath the head having been removed because it is thought their expansion may cause piston distortion. Each piston has two rings only, oil being kept down by the use of a long skirt and the weight of the piston assembly with rings and wrist pin is only 1.15 lb. Another factor in vibration elimination is the use of long connecting-rods, these being 15 in. center to center, the ratio connecting-rod to stroke thus being 2.22. This, of course, cuts down the unbalanced forces to some extent as it is a perceptible amount longer than the conventional. The connecting-rod weighs only 3.3 lb. being a highly finished I-beam forging.

Reciprocating Parts Are Light

Lightness of reciprocating parts is studied also in the valve mechanism, both the valves themselves and the tappets being

as light as considerations of strength will allow. These parts can be studied in the drawings which also make clear the method of assembly of the four-bearing camshaft. For the latter a very interesting form of drive is used this being a multiple bush roller chain. In effect this is a number of narrow roller chains side by side, but the rivets or pins pass right across the whole row so that there is a series of small rollers separated by side plates. This type of chain operates as quietly, or even more quietly than a silent chain, and does not required any adjustment because a spring-supported idler bearing upon the back of the chain can be used to maintain the tension. It is a light form of chain camshaft drive and highly efficient.

Lubrication is a high pressure system, all the crank and connecting rod bearings receiving a supply, together with separate feeds to the camshaft bearings, the chain and the chain idler. In the cross section of the engine it will be noticed that the oil filling cap is located on one of the crankcase arms in a position of ideal accessibility.

Transversely across the front of the engine is a shaft driven by skew gear from the camshaft, this having the magneto and water pump mounted at opposite ends the thrust of the water pump being balanced by the thrust of the skew gear.

The cylinders being an exceptionally neat block casting the carbureter bolts directly to a flange on the left side the intake passage passing between the middle cylinders and then running fore and aft in close proximity to the separate exhaust manifold, this giving the necessary warmth. In the sections of the engine it will be noticed that the water spaces are proportioned very well, giving a free flow everywhere. The U. S. L. flywheel generator and starting motor is entirely inclosed within the crankcase, a hand hole giving access to the brushes and to the dry-disk clutch. This clutch, by the way, has twenty-four disks and operates with a very light pedal pressure; it is one of the easiest clutches to control in use to-day. Having a small diameter center, and a clutch brake, the inner member has but little flywheel effect, making it easy to change gears without much regard to the speed the car is making.

The engine bolts rigidly to the frame having four supporting arms on the crankcase and the amidships gearbox is brought into alignment, the two being connected by a flexible coupling. Placing the gearbox well back in this way permits the gearshift lever and the brake lever to be brought up conveniently from the top of the box and yet stand in the correct position relative to the driver. There is no especial peculiarity in the gearset, it being characterized by large diameter shafts and wide gears.

Brakes Are Large in Area

Behind the gearbox is the foot brake, this having expanding shoes faced with Raybestos and a steel drum with cooling ribs turned upon it. Its dimensions are 11 in. by 2½ in. and it has immense power combined with smooth action. The easiest way to obtain smoothness in a brake is to provide large surfaces, and it may be interesting to calculate the effective area of the Mercer transmission brake. On the assumption that of the total circumference of the drum the brake shoes only bear effectively on two segments of a 90 deg. angle, and this is the usual assumption, the Mercer brake area works out at just under 14 sq. in. The expanding brakes on the rear axle, operated by the hand lever, are 16 in. by 2½ in. and thus their combined effective area is 40 sq. in. At 20 m.p.h. the rear wheel is making 210 r.p.m. and, since the gear ratio is 3.6 to 1 the rubbing speed of the transmission brake is 36 ft. per second, as compared with 14 ft. per second for the road wheel brakes. Multiplying rubbing speed by area engaged and we get figures of comparative effectiveness for the road wheel and transmission brakes of 560 and 504 respectively.

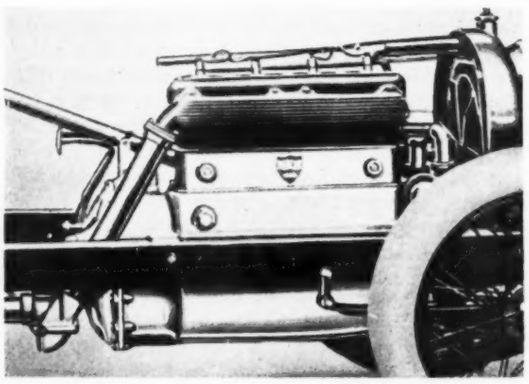
In the rear axle, lightness has again been a consideration, but the particular features being the spigot bearing for the bevel pinion, shown on page 449, and the method by which the driveshafts are slid in through the hubs and held secure against rattle by springs. There is no torque rod, the axle being bolted directly to the springs, which are underslung.

Semi-elliptic springs are used both front and rear, the latter being 59 in. by 2¾ in.; all the shackle bolts are hollow and fitted with oil retaining lubricators.

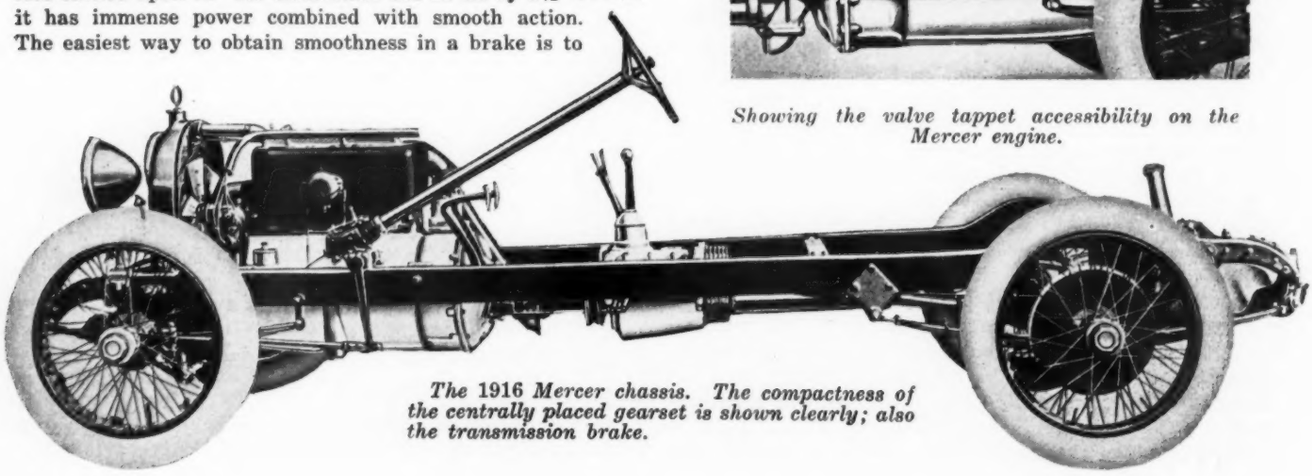
Great care has been taken in laying out the steering, which is irreproachable for lightness and accuracy. At 60 m.p.h. it operates as easily as at twenty and this is doubtless largely due to the use of ball thrust bearings for the steering knuckles and in the steering worm box.

Accessibility a Strong Feature

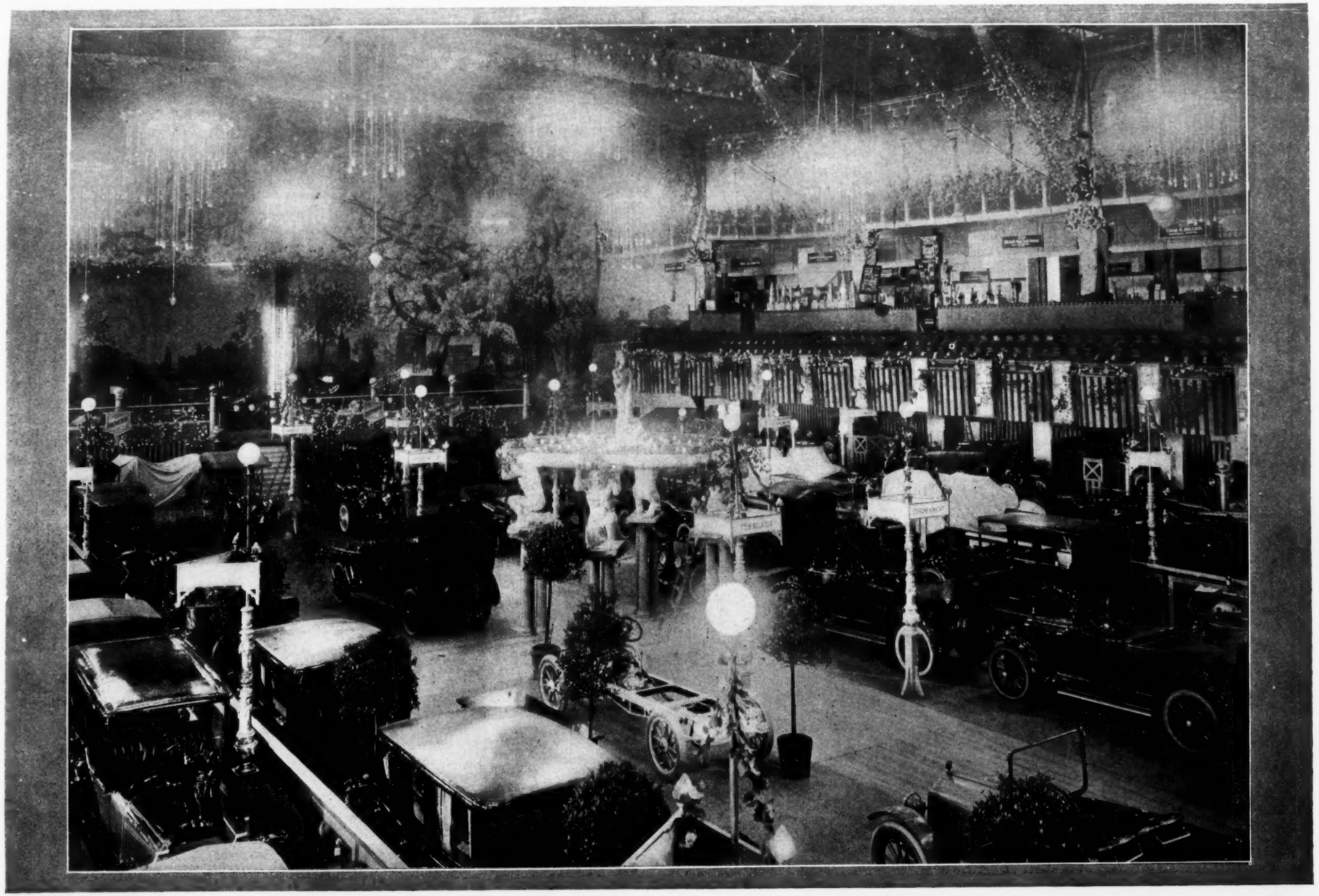
As to the detail, this is equally well worked out, and accessibility is a strong feature. Brake adjustments can all be made readily by large hand nuts situated beneath the front floor board, the carbureter with its vacuum fuel feed has no other parts near it, the magneto is likewise clear of all obstructions and the valves have nothing in front of them. This accessibility on the engine is certainly aided by the U. S. L. starter, since this needs no mechanism outside the flywheel case.



Showing the valve tappet accessibility on the Mercer engine.

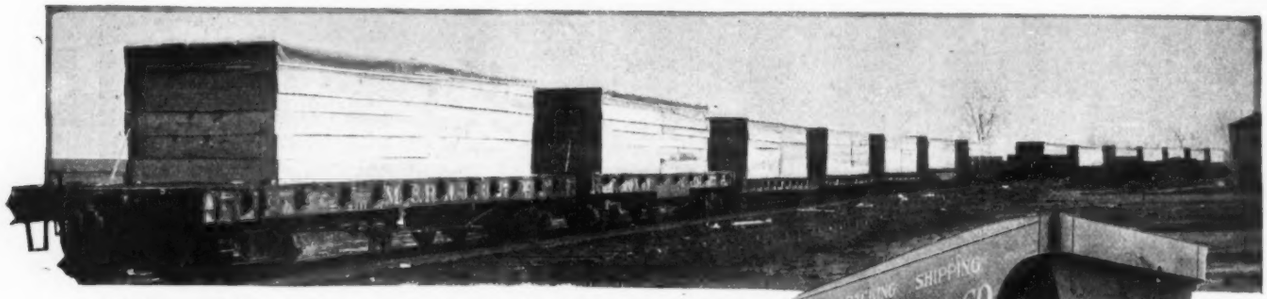


The 1916 Mercer chassis. The compactness of the centrally placed gearset is shown clearly; also the transmission brake.

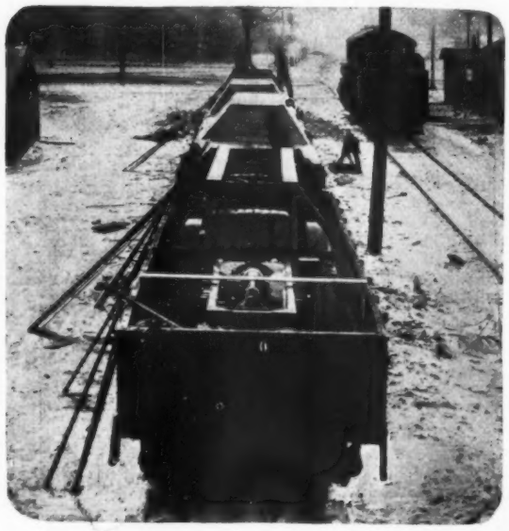


General view of Grand Hall at the Boston show finished in black with gold striping. The group at the intersection of center aisles represents Invention, Progress, Industry and Success bearing aloft a giant wheel. The gallery is given over to car and accessory exhibits

Dealing With Freight Car Shortage



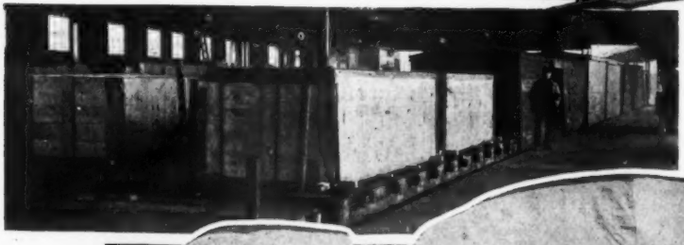
A shipment of fifty-six Chalmers cars to Philadelphia on flat and gondola cars. Two cars go on a freight car. They are well protected with oilcloth and then boxed, the boxes being roofed with waterproof material

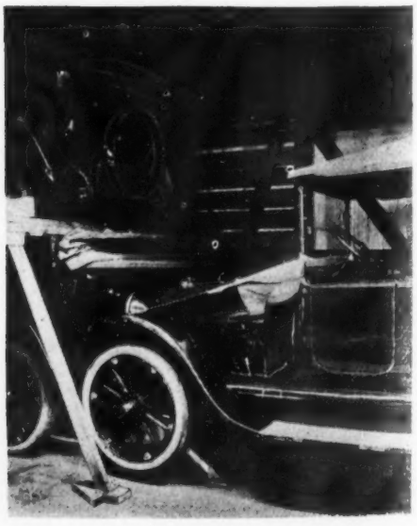


Packard, owing to the shortage of automobile freight cars, is well satisfied with getting gondola cars to ship its trucks

A 3½-ton Federal with special large van body had to be shipped on a flat car

Several trucks had to be shipped by express by the Federal Motor Truck Co.

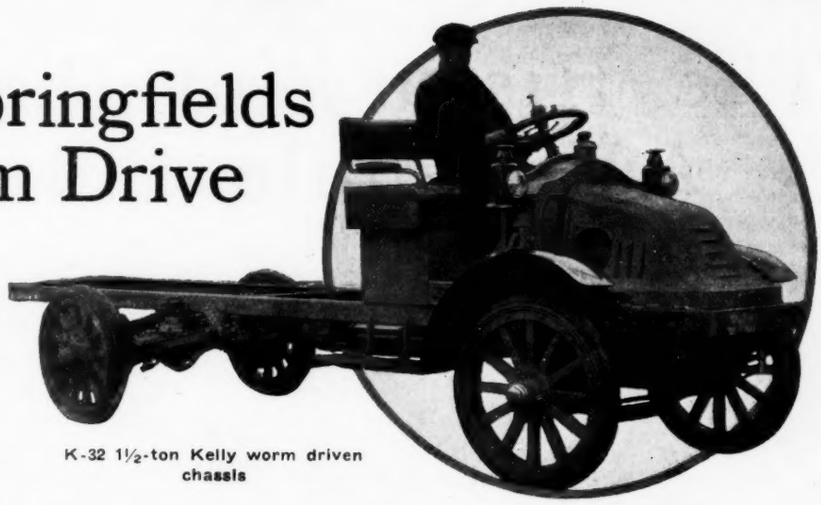




Above—Part of a shipment of Cadillacs going to Auckland, New Zealand. These cars are boxed, the top being waterproof. They are shipped to the coast on flat cars. Below—How Paige cars are being shipped, showing how they are being protected against rain and theft. Right—Studebaker cars are shipped from three to five in a freight car now. This illustration shows how two cars are loaded in one end of the freight car, two others being in the opposite end, while the fifth car stands in the middle. The latter goes with the top folded

New Kelly-Springfields Have Worm Drive

Six Models With Chain Drive and Two With Worm Drive Now Form Kelly Line



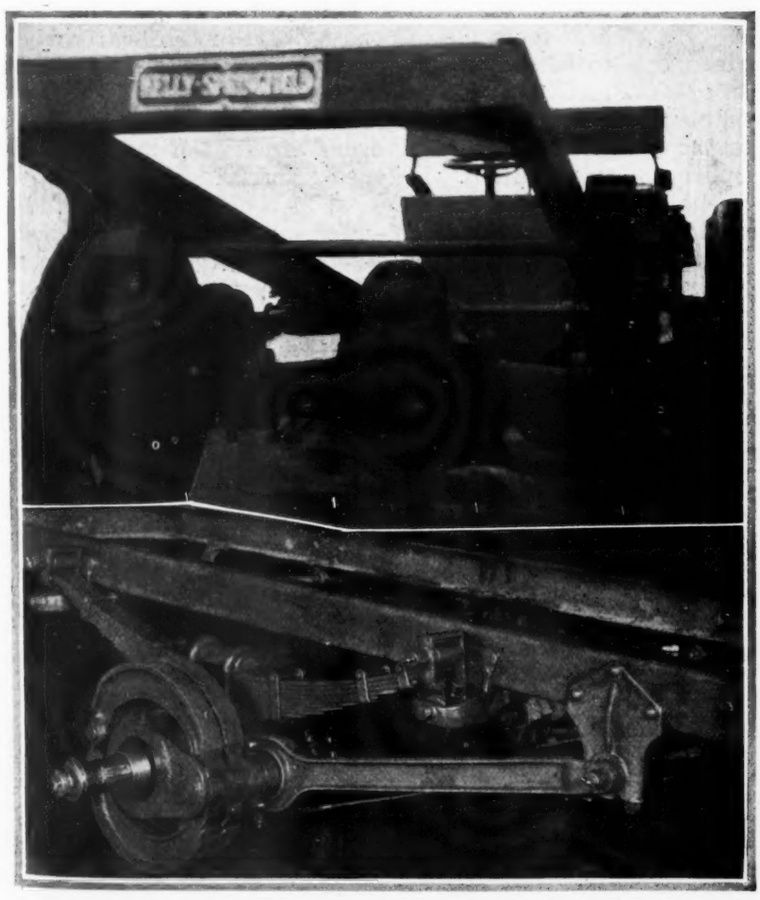
K-32 1½-ton Kelly worm driven chassis

THE Kelly-Springfield Motor Truck Co., Springfield, Ohio, has been one of the last of the larger producers to abandon the chain, although such abandonment in this case only amounts to its adoption as an alternative on two of the lighter models, there being six chain-driven sizes still in the catalog.

The two newcomers are of 1½- and 2½-ton capacity and are similar in almost every respect, excepting only final drive, to two chain-driven models of the same capacity. In addition to these there are 3½-, 4-, 5- and 6-ton models, all chain-driven. The last four of these are the same as announced at the beginning of the year and listed in THE AUTOMOBILE'S specification tables published Jan. 13. The 3½-tonner is the same vehicle as was formerly built for 3 tons, but with some heavier parts to sustain the increased load. The 2½-tonner is a similar outgrowth of the former 2-ton model. The 1½-tonner is practically as before, the 1-ton size being dropped.

Adaptation of the worm drive to the Kelly chassis has not entailed any other radical changes. The same motor, under its French hood, with drive through a torque-tube-inclosed shaft to a midships gearset is employed, and the frame remains of pressed steel in a flexible form, there being only three cross-members, with round bars supporting the spring shackles.

The driveshaft has been connected with the driven gearset shaft with a universal and carries another between it and the axle. The gearset occupies practically the same position as in the chain-driven models and is suspended on a wide yoked cross-member drilled to receive the rear flange of the gearset on the same jig as is the jackshaft flange.



Above—K-32 1½-ton Kelly worm driven chassis showing semi-floating rear axle
Below—Brake and radius rod on K-32 1½-ton Kelly worm driven chassis

The axle, while containing a Timken worm and gear, is otherwise of Kelly manufacture and is of the semi-floating type. Radius rods are used, as on the chain-driven models, with the torsional stresses falling on the springs. A feature of the Kelly spring suspension is that the right rear springs contain one leaf more than the left rears, thus allowing for the excess load imposed on the right spring when running on the usual crowned road.

Brakes on the new models have been placed on the rear axle, side by side, and are expanded by cams of unusual size. The brake carrier is a solid casting which includes the spring perch and wheel bearing housing and bolts directly to the axle housing. It is lubricated by one grease cup of large size, supplying lubricant to all parts contained in it excepting the brake-shoe pivots.

The new models are subject to the same wide range of wheelbase options that is offered in the chain-driven ones, affording load platform lengths of from 9 to 15 ft. back of the driver's cab.

From the motor the drive is taken by a cone clutch, mounted on the end of a rigid torsion member extending with its shaft back to the gearset. This eliminates any flexible joints between these two members. The gearset affords three forward speeds on the selective plan.

The steering wheel is to the left with central levers.

The History of the American Automobile Industry—20

Lenoir Experiments Advanced Knowledge—Steam Engine Taken as Basis and Explosion Used to Heat Air—Engine Driven by Air Expansion

By David Beecroft

LAST week the Perry explosion engine of 1844, incorporating many of the essentials of an internal combustion, was shown as the high mark of American inventive genius of seventy years ago. Now the thread of progress in the internal combustion engine shifts to Paris, France, and instead of 1844 it is 1861, seventeen years later. After Perry the next great forward step was taken by Jean Etienne Lenoir, Paris, France, whose now famous patent shows what a grasp he had on the explosion engine, although even then Lenoir looked upon it more as a modification of steam rather than a complete internal combustion type.

Used Steam System

Lenoir was convinced that he could take a steam engine and, by few changes, convert it into an explosion type. Lenoir did not look upon his engine as an explosion type as we do to-day, but rather as one in which he took in a part charge of pure air, and followed it by an explosive mixture of some hydrocarbon and air. Lenoir then exploded the mixture by an electric spark, as the heat of this explosion was wanted to expand the volume of air, the expansive force of the air driving the piston.

With this partial conception of the internal combustion engine as we know it to-day, it is but natural to find Lenoir's engine very similar in design to a steam engine. The illustrations are taken from his engine as manufactured in large quantities in 1865. At that time over 400 of them were in use in France and 100 had been built in England. To Lenoir belongs the credit of being the father of the practical explosion engine. Previous to his day all explosion engines had been largely experimental. Lenoir in 1861 to 1865 was to the explosion engine what Newcommen was to the steam engine in 1704. Each added the practical touch to his invention.

Lenoir's engine was a double-acting type, an explosion taking place at each end of the piston, steam engine fashion. He used slide valves at one side of the cylinder for the intake air and gaseous mixture and a similar slide valve at the opposite side for the exhaust. The one valve served for intake at each end of the piston and the exhaust valve performed a similar function. These valves were driven by eccentric shafts from the crankshaft (see illustration). The top illustration with a cylinder in section shows intake and exhaust passages very small, but they extended a considerable distance circumferentially, thus obtaining sufficient area. The intake valve operated to first let in a volume of 85 per cent of the combustion chamber of pure air; this was then followed by 15 per cent of explosive mixture.

Lenoir did not have a carbureter in even a vague sense as we know it to-day. Instead he carried the hydrocarbon in a small vessel or boiler. In the bottom of this boiler he placed a coil which he connected with the exhaust jacket of the engine, thus using heat as we do in the carbureter to-day. The heat from the coil caused part of the hydrocarbon to pass off in vapor, and Lenoir conducted it directly into the cylinder.

Passing to the ignition system as used by Lenoir, we find him using every essential of modern electric ignition. He used spark plugs (see illustration) that are identical in functioning with those of to-day, and only differ substantially in design in that there was a separate electrode *E* connected with the spark plug shell—the center electrode *C* was practically identical with modern practice.

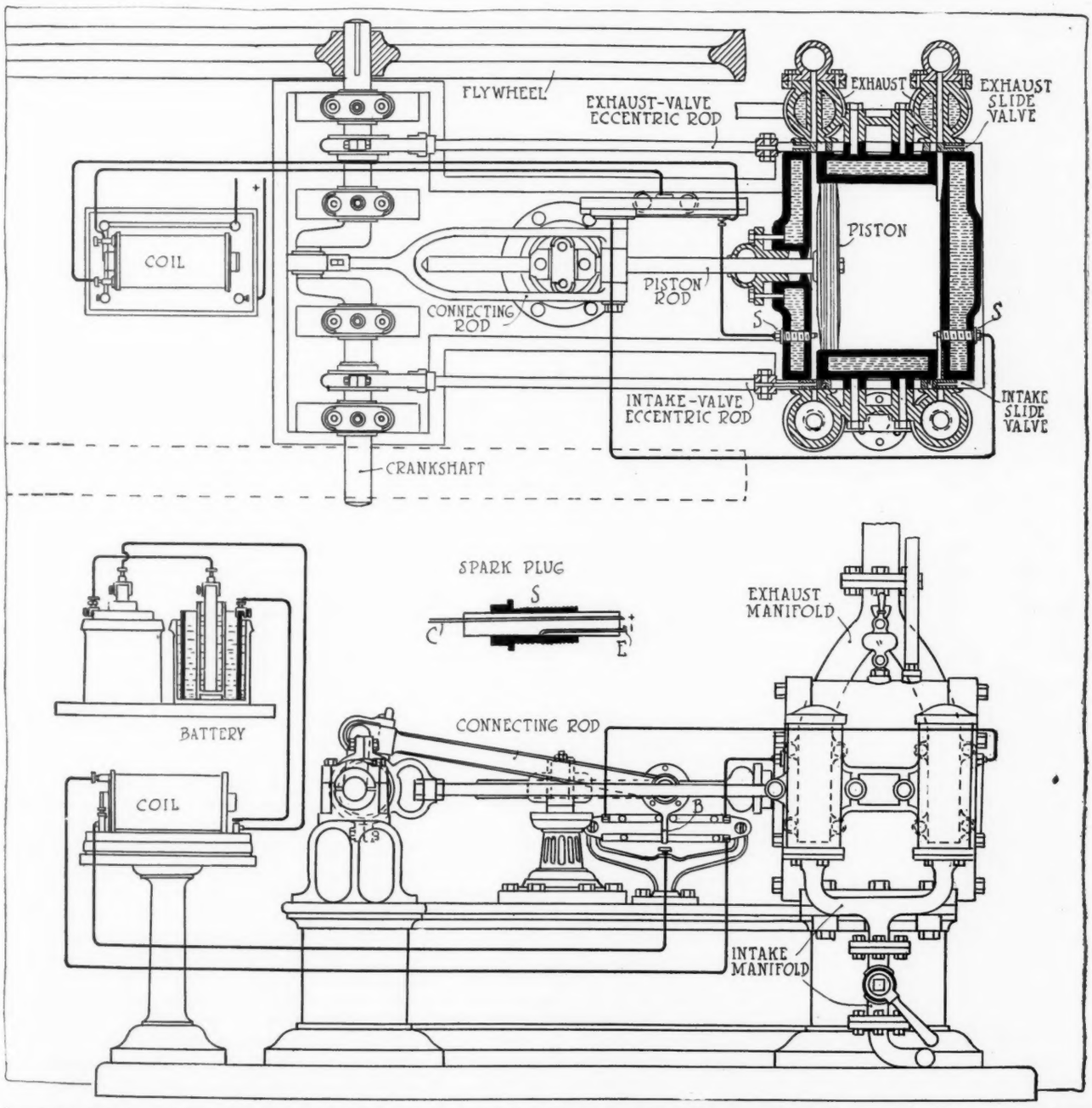
But Lenoir went farther in his electric system, and was among the first to use the step-up or Rhumkorff coil to give his high voltage current. The low voltage current was taken from a primary battery (see lower illustration). As a means to deliver the current first to one spark and then to the other Lenoir was entirely modern. He attached his distributer *B* to the piston rod and contact was made to the two plugs in proper sequence. In his crude distributer he used hard rubber or guttapercha in which he embedded the metal segments, practically identical in principle with what is done to-day.

Water Cooled Spark Plug

One feature in which Lenoir was perhaps a little in advance of the art of to-day was in waterjacketing his spark plugs. The illustration shows how the two plugs extend entirely through the cylinder waterjacket. Lenoir waterjacketed his entire cylinder walls and both ends. Although Lenoir had in reality the internal combustion en-

gine as we know it to-day, he was not aware of what really took place within the combustion chamber, or if he later became aware of it, this fact remains that when his patent was issued he had not such a conception. His patent has only one claim which clearly sets forth his conception of the engine. Here it is: "The arrangement in an engine substantially as described, of the parts for the admission to the cylinder successively of air and inflammable vapor or gas in such requisite quantities and proportions as that the former (air) shall act upon the piston by expansion on being heated by the ignition of the latter (gas).

Lenoir very clearly set forth the fact that his engine was not a gas engine, but rather an explosion one. In his patent he sets this forth in the following terms: "My intention relates to engines in which the motive power is air diluted or expanded or heated by the combustion of an inflammable gas; and it is based on two fundamental principles: First—the application or the combination or mixture with atmospheric air of lighting gas or any other inflammable gas; and second, the simultaneous action of both in an engine deriving its elements of function from electricity and operating substantially in the manner of a steam engine. I employ gas and air in the proportions of 15 and 85 per cent; thus in my engine the function of the gas is as a fuel that can be ignited without producing any shock, for the purpose of heating the air that is mixed with it. The air thus dilated acts on the piston as steam in a steam engine."



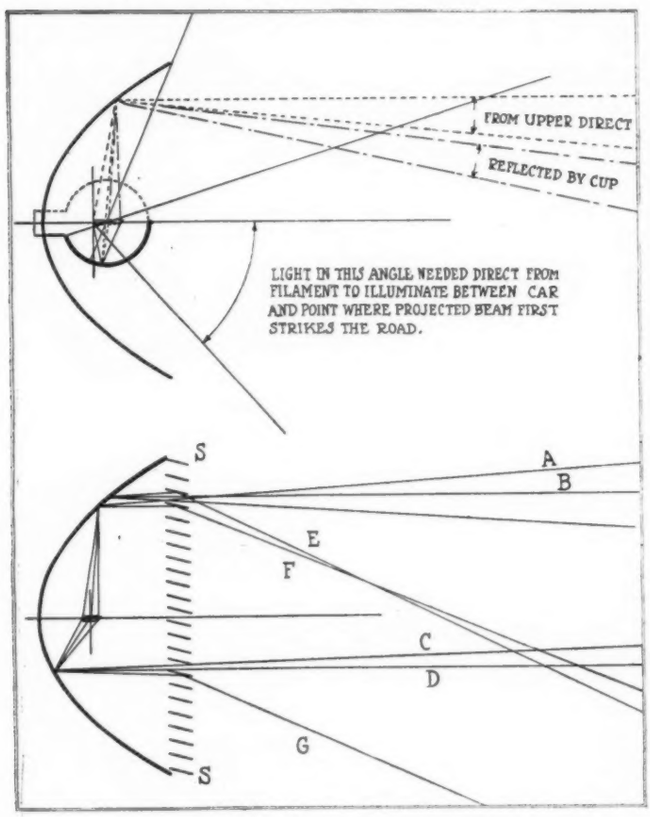
Lenoir's explosion motor of 1861, the first practical explosion motor built. Over 400 of these were made in Paris and 100 in England. Lenoir used modern electric ignition for the first time. His engine used slide valves

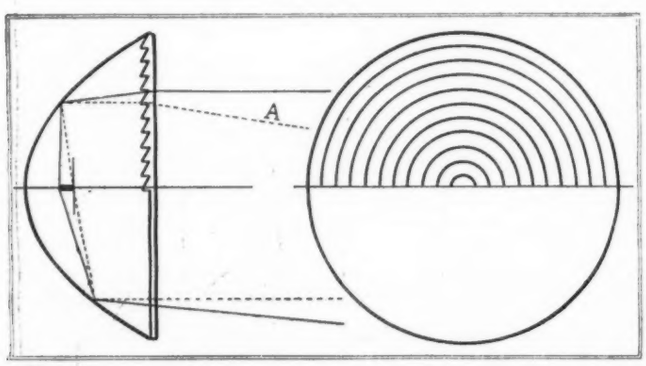
What Good Lighting Really Is*

Automobile Lighting Analyzed from the Lighting Viewpoint

By Emerson L. Clark

THE reflector does not actually have to be cut away, it is sufficient to put a shield over half of its surface or over half of the glass front of the lamp. However, if this shield is over the lower half of the glass front the light on the road directly from the filament is cut off and this light is needed to illuminate the space between the car and where the beam first becomes effective. The change in the road surface covered by changing the same reflector and light source to this type of beam is indicated in Fig. 6 by the difference in the area within the full and the dotted lines. The space between the lamp and where the beam becomes of effective width depends upon light directly from the filament for illumination. The absence of such light will be quickly noticed. Instead of putting an opaque screen over half of the lamp front, use has been made of a translucent diffusing screen; this absorbs and scatters light from one-half of the reflector so that its glare is reduced. This increases the illumination near the car, but does not appreciably increase the illumination at a distance over what would be obtained by the opaque shade. This translucent diffusing screen has two defects: First, unless it is very dense it will glare when a high candlepower bulb is used and the glare region is a large one; second, the strong scattered light thrown upward will cause blinding of the driver in fog and snowstorms, as was explained before.





Figs. 16, 17 and 18, showing effect of silvered bulb, of light-deflecting parts and of a prism front glass

Half Light Wasted

The great disadvantage of these various methods of using one-half of the reflector to get an improved distribution is that about one-half of the light that was in the old type of beam is wasted and the intensity especially at a distance is reduced.

Fig. 20 indicates a reflector construction which produces the same type of distribution but puts into the beam the light from both halves of the reflector. This reflector is constructed with an offset on a horizontal plane and the focus of the lower half is near the front end of the filament and the focus of the upper half is near the back end of the filament. In this position each half throws a beam having the distribution above described for a half reflector. The beams from the two halves superpose a short distance from the lamp and the intensity is doubled all over the field. There is an additional advantage over the single half reflector, in that slight irregularities in the single half reflector beam are smoothed out when two beams having different irregularities are superposed.

When properly made, using the correct separation of the foci of the two halves and used with a bulb having an axial length of filament a little greater than the separation of the foci, this reflector will give better lighting with the same candlepower than any other known arrangement. These reflectors are best made with dies from a single piece of metal. The slide shows a lamp containing a reflector of this type.

Fig. 18 shows a construction which was designed to produce the same results as the reflector above described. In this construction the glass front is moulded with a series of concentric semi-circular prism rings covering the upper half of the lamp front. The filament is drawn to the rear of the focus so that the uncovered half produces the desired distribution before mentioned. The prisms on the upper half refract the rising cones of light across the axis, thus superposing them on the beam from the lower half. The simple theory of this device would indicate that it should be very good, but there are a number of circumstances that combine to reduce its efficiency. First, if made of a single piece of

*Concluded from page 415.

glass, it will not be achromatic, the prisms will disperse and spread the light cones, as well as deflect them. The intensity of the maximum is thus reduced. Second, some light is scattered from the risers of the prism steps. Third, molded glass having abruptly changing thickness as the prisms have, often small cooling wrinkles form which scatter light and thus cut down beam intensity and efficiency.

Those types of prism fronts which deflect the top half of the beam downward as a whole without making each individual cone cross the axis are not as good as the above, because the portion of the beam which they deflect has its maximum intensity on the bottom, and as it is deflected downward as a whole the maximum intensity is still on the bottom after being deflected, whereas to produce uniform lighting it should be near the top.

Fig. 16 represents another arrangement designed to increase the light from one-half of a parabolic reflector, while still retaining the desirable distribution which it gives with the filament drawn out of center. To have the maximum effect in reinforcing the beam direct from the unshaded half, the reflecting cup must be truly hemispherical and set with its center coinciding with the center of the bulb filament. This is difficult with many bulbs because the filaments are not in the center of the bulbs. If the bulb filament is located to one side of the cup center the light reflected by the cup forms a real image on the side of the center diametrically opposite from the filament and this image may be considered as the source of all of the light striking the main reflector from the cup. It will form a beam of light which is mostly separated from that formed by light coming direct from the filament to the main reflector. Under these conditions the light reflected by the cup does not reinforce the beam of light cast from the half reflector.

If these cups are placed on the lower half of the bulb the light on the road direct from the filament is cut off giving a dark area immediately in front of the car. To overcome this portions of the front of the cups have been cut away to let out the light on the road. This reduces its reinforcing power. Light from a certain zone in the rear of the cup is reflected directly out the front of the lamp and upward without striking the main reflector and contributes nothing to the beam intensity. The light which finally does get into the beam suffers loss by one extra reflection and two extra transmissions through the walls of the bulb. With all of these losses the hemispherical reflector attached to the bulb forms little more than a convenient means of shading one-half of the main reflector, and for this purpose is extremely effective.

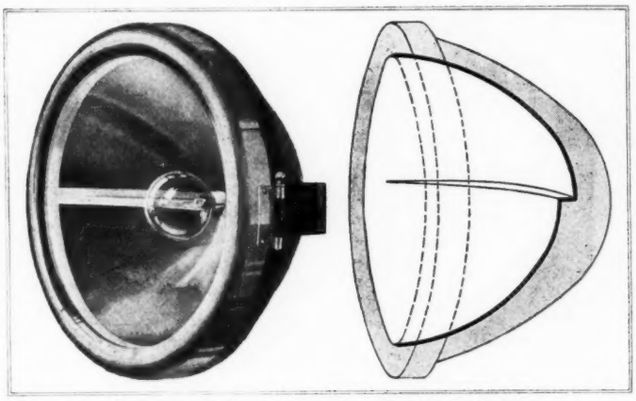


Fig. 20, Details of lamp with divided reflector

Deflecting Slats

Another type of no glare attachment is shown in Fig. 17. In this device a number of closely spaced reflecting slats or louvers are placed across the front of the reflector to prevent rays of light rising above the horizontal. This device prevents glare but does not give effective lighting at a distance. The light acted upon undergoes the loss of an additional reflection and strikes the ground too near the car.

Focusing

With all of the foregoing arrangements for improving the distribution of the light one definite position of the filament gives the best result. This was not true with the plain parabolic reflector where sharp focusing gave a good light at a distance and a poor light near the car, while drawing the filament a little out of focus gave a better light near the car but a poor light at a distance. Some people preferred one evil, some the other, and each focused his lamps to suit his own preference. Interchangeable bulbs under these conditions would be of little advantage because the car owner would not want a fixed focus lamp in which he could not control the focusing. But with constructions designed to give a distribution of light suitable for no-glare lighting and general increased illuminating efficiency as previously described, the case is different. Here one focusing of the filament unquestionably gives the best results and it is not a question of deciding which of two evils is to be preferred as is the case with the plain parabolic reflector. This being the case it would be a distinct advantage to have bulbs that are optically interchangeable, that is bulbs in which the filament coil dimensions run reasonably uniform and which have the filament axis coincident with the axis of the base and with the distance from the locating pins on the base to the filament center within distinctly close limits.

With such standardized interchangeable bulbs the headlamp could be built without any focusing adjustment, but with the bayonet socket rigidly set at the factory to give the correct light distribution with the standardized interchangeable bulbs. This would obviate any skilled adjusting by the car owner when replacing bulbs and would insure good results in lighting regardless of the skill of the owner.

(Fig. 21 shows a base construction and optical jig with which interchangeable bulbs can be produced.)

To secure the best results in lighting and at the same time

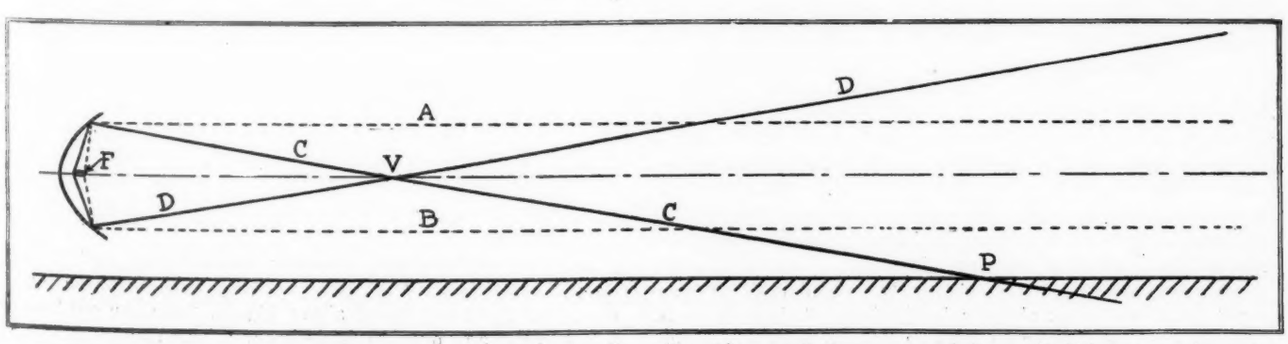


Fig. 19, Rays from part of filament at focus point F reflected parallel, rays from behind F cast D, D the glaring light, and C, C on road

avoid glare it is necessary that the lamps not only give the proper distribution but also that they be properly pointed. Bulbs having their filament to one side of the axis of the base will change the direction of the beam of light and require repointing of the lamps. This will either require bending of the lamp brackets or using means especially provided for the purpose. Car makers would do well to devote some attention to this point. If interchangeable lamp bulbs were available the lamp once pointed correctly would never have to be adjusted again unless deranged through accident.

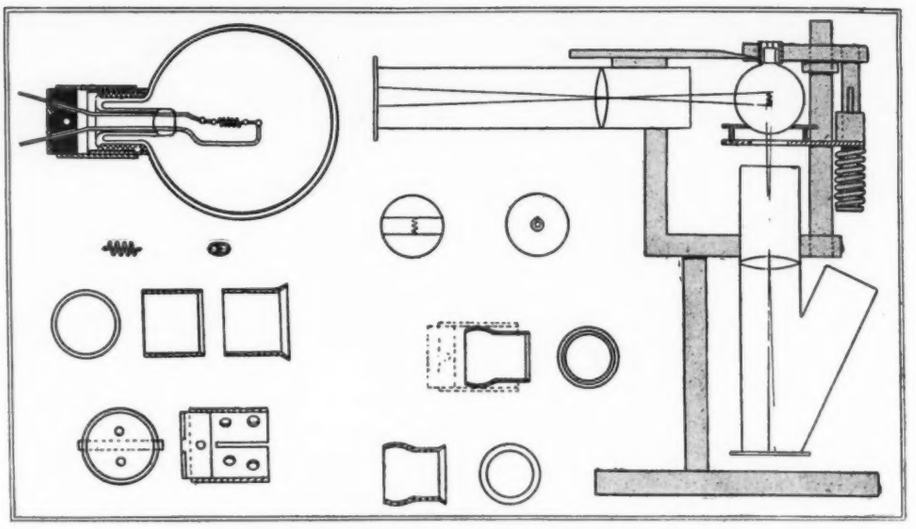


Fig. 21, Device for testing location of filament in bulb

Mounting Height

Other things being equal, the lamps should be mounted as high as possible consistent with avoiding glare. The higher the lamps are the more nearly normal do the rays strike the roadway and the smaller the difference between the vertical and the horizontal illumination, and the less exaggerated are the shadows of projections on the road surface. High mounting requires a greater vertical spread of beam to properly light the road and therefore to secure the best results the lamp and filament dimensions will have to be chosen to suit the mounting height.

I venture to say that the reason why some high priced cars made to-day have low mounted lamps is because the experimenters found that with the particular type of lamps in their possession they secured better results with low than with high mountings. But a properly designed lamp mounted high will give better all around results than any lamp mounted low. I believe that a height of 3½ ft. to the center of a lamp having a 9 in. or smaller reflector is about the highest that can be used where the beam is kept below 3½ ft. beyond 75 ft. from the car.

It needs little argument to show the advantage that would accrue to the automobile public through having uniform lighting regulations over the whole country. The automobilist is essentially a traveler and in the course of a season he is liable to come within the jurisdiction of many different authorities. The annoyance caused by having to comply with many diverse lighting regulations during these travels can easily be appreciated.

There is one system of legislation which is the best. The essential requirements of lighting regulation are the same everywhere and can therefore be met by a single set of regulations. The first great requirement in lighting regulation is to insure a maximum of safety to all parties concerned. The second is to reduce any annoyance or nuisance that may be connected with lighting to the smallest degree consistent with the meeting of safety requirements. The third requirement is that the comfort, convenience and pleasure of the automobilists should be insured in the highest degree consistent with meeting conditions one and two.

A system of regulation which best meets all three of these demands is the best system possible and should be adopted uniformly everywhere. Lighting regulations should be as simple as possible consistent with attaining the desired results. They should be couched in such terms that they can be readily understood by people of moderate intelligence and education, and in such a manner that it is easy to ascertain with precision whether they are violated.

The requirement that no strong beams of light be projected from the lamps above a level of 3½ ft. beyond 75 ft. from the car and placing no limit on the intensity which may be used below this height is a step in the right direction, and this regulation is coming into wider and wider use, which speaks well for the intelligence of the officials who have adopted it.

This regulation fulfills part of the three essential requirements but only a part. The easiest way to comply with this regulation is perhaps to greatly cut down the light and drive with an insufficient illumination. This does not meet with the requirements of safety as pointed out earlier in the paper. An addition should be made to the regulations which will specify a certain minimum of illumination that will promote the interests of safety. This should specify that the lamps throw an illumination of 0.025 ft. candles measured on the surface of a level road 200 ft. in front of the car. Also normal to a line from the nearest lamp the illumination should measure 0.1 ft. candle 10 ft. to the front and 10 ft. to the side. This latter requirement is easily met if improper attachments are avoided.

Appended to the regulations should be some recommendations as to what constitutes good lighting, for the purpose of disseminating knowledge of good lighting to the public that would be difficult to reach otherwise. In this could be briefly embodied the statements that uniformity of the illumination on the road surface is desirable; that patches of excessive brightness are undesirable; that a large area of illuminated surface promotes efficiency of vision as well as safety; that strong diffused or scattered light above the level of the lamps even though insufficient to cause glare makes driving in a fog and snow storm dangerous.

Form for Legislation

All motor vehicles capable of traveling 20 m.p.h. shall be equipped with two headlights adjusted so as to project a beam of light on a level road surface covering at least a length of the road between a point 25 ft. in front of the car and a point 200 ft. in front of the car, with an illumination that shall measure on the horizontal surface of the road at every place on the straight line joining these two points at least 0.025 ft. candles.

Also the illumination measured anywhere between the road surface and 3 ft. above it and normal to the rays from the lamps, over a point 10 ft. in front of the car and 10 ft. to either side of the center line of the car shall not be less than 0.1 ft. candle.

Further, no headlight on motor vehicles shall emit illumination measuring over 1000 apparent candlepower when measured from any point above 3½ ft. from the surface of a level road and over 75 ft. in front of the car.

South's Profits $10,000,000,000—Car Sales Gain

Rapid Agricultural and Industrial Progress of This Great Section Forecasts Opening of Enlarged Market for Automobile, Truck and Accessory Manufacturers

AT the very door of the bulk of the American automobile factories lies a great consuming territory which holds immense possibilities for the sales organizations of the various concerns. It is the South, with an area of one-third of the total area of the United States, and a population of about 35,000,000. The people of this rich region have drawn $10,000,000,000 of wealth from the rich coffers of their land. This money demands an outlet through the buying of all the necessaries and luxuries the country can supply. Of this sum, $1,000,000,000 comes from the cotton crop—$720,000,000 from the lint and the balance from the products of the seed.

The close of the year found spot cotton future contracts 4½ cents higher than one year previous, or a minimum gain of $25 per bale. Some are predicting 15-cent cotton by spring and 20-cent by Jan. 1, 1917.

King Cotton's Rivals

The war has taught the Southern farmer a great lesson, for it is no longer a one-crop land. During the past year the doctrine of crop diversification has spread to the four corners of Dixie. In evidence of her emancipation from the slavery of cotton there is the significant fact that the value of the grain crop produced by the South last year was $1,330,000,000, which is $100,000,000 in excess of the value of the most profitable cotton crop ever gathered.

The South produces 88 per cent of the total tobacco crop; 28,000,000,000 ft. of the total of 31,000,000,000 ft. of lumber manufactured in the United States last year came from the South; she produces 75 per cent of the coking coal; 41 per cent of the zinc; 42 per cent of the lead; 80 per cent of the phosphate, and produces fifty-five of the fifty-seven useful minerals mined in the United States.

The New South is a growth of a scant fifty years out of the ruins of war, while the stable institutions of New England have thriven undisturbed for centuries. Comparing the two sections, the people of the South had a few weeks ago on deposit in national banks alone $735,561,874. New England had demand deposits of $484,654,630; the South, $586,155,168. New England had time deposits of $73,175,851; the South, $149,406,705.

A Rapid Growth

Commercially, industrially and agriculturally, the South has grown faster during the last decade than any other section of the country. The population of the South in 1910 was about 30,510,000, and during the past five years population has increased at the rate of sixteen per cent. Outside of the main centers of density, where there is a natural growth of large proportions, regardless of accretions from the outside, no other section of the United States has shown a larger growth during the period named.

With no design or inspired relation, news articles are appearing in the daily press singularly consistent and of one note, in their relation, of a healthy activity and industrial condition over the Southern States.

This year, as a result of their labors, the people of Dixie have more wealth than they ever had at the close of any year. The money constitutes a factor that cannot be neglected by the sales campaigns of the automobile industry. There are few automobile factories in the South. Alabama, Arkansas, Florida and South Carolina have none. Kentucky, Tennessee and Texas have three each, while Louisiana, Virginia, Georgia and North Carolina each have one automobile factory within their borders. They cannot supply the demand.

Many New Dealers

That the factories are beginning to awaken to the possibilities in the South is shown by the fact that the manufacturers who have no representatives in this territory are sending traveling men to the big distributing centers to establish an office or branch, or to make contracts with a new dealer or distributor.

A comprehensive review of the activities of seven of the Southern states, Alabama, Florida, Georgia, Kentucky, Mississippi, Louisiana and Tennessee, forcibly brings out the growing industrial importance of the South.

South Grows 60 Per Cent of World's Cotton Crop

OF course cotton is the great staple of the South, which raises about 60 per cent of the 22,000,000 bales constituting the annual crop of the world, the contribution of the United States to this total being normally 15,500,000 bales per year. The 1913-1914 crop was 14,000,000 bales, and the 1914-1915 total was approximately 16,500,000.

The seven States, Alabama, Florida, Georgia, Kentucky, Mississippi, Louisiana and Tennessee, produce nearly 5,000,000 bales per year, with a total valuation of over $266,000,000. As shown in the accompanying tabulation, compiled from the most recent Government ginner reports, the bulk of this crop is upland cotton bales, the total being 4,424,475, as compared with only 84,769 bales of sea island cotton, which is largely used for automobile tire fabric, and 294,472 linter's bales. The value of the upland cotton is $248,876,718.75, that of the sea island $8,264,977.50 and the linter's bales are worth $9,010,843.20.

Cottonseed Products Important

Besides the cotton itself, these States produce 1,228,688 tons of cottonseed products, which sells at an average price to the cottonseed oil mills of $37.50 per ton, or a total of $46,075,800. Cottonseed oil crude obtained by the mills totals 1,150,000 bbl., of 50 gal. each, other products being cottonseed cake, meal and hulls.

The upland cotton is used for yarn, sheeting, toweling, thread, etc. Sea island cotton is useful for tire fabric and covers, fine thread, lace curtains and underwear, filling for silk ribbon and mail sack duck. Linter's is employed in gun cotton, nitro-cellulose, batting, wadding, mattress stuffing, carpet lining, mixing with shoddy, etc.

Cottonseed oil is used for insulating material, cosmetics, cooking and salad oil, oleomargarine, soap, roof composition, nitroglycerin, linoleum, cheap paint base, etc. The cake and meal are utilized in bread and cake and as feed for cattle, horses, mules, swine and sheep, and the hulls for feed, fertilizer and bran. Thus many fields of usefulness are filled and waste is minimized.

Georgia Leads in Cotton

Of the seven States mentioned, Georgia is credited with the largest cotton crop, according to recent statistics, producing 1,865,624 bales of upland, 56,722 bales of sea island and 118,000 bales of linter's, a total of 2,040,346, or more than any two of the other States combined. It produces two-thirds of the total crop of sea island of the group, 56,722 bales, Florida, with 28,047, being the only other producer of this variety.

Alabama ranks second of the seven States in total output, its 1,073,666 bales being made up of 1,012,966 bales of upland and only 60,700 bales of linter's.

Mississippi is a close third, with a crop of 958,814 bales, consisting of 898,414 bales of upland and 60,400 bales of linter's.

The Other States

Louisiana's 354,530 bales give that State fourth place, its upland being 333,908 bales and its linter's only 20,622, or much less than Tennessee's linter's crop. Although this was 32,250 bales, Tennessee's total was only 318,775, including the 286,525 bales of upland, ranking the State fifth of the group. Florida is sixth with only 57,585 bales, of which 28,047 are sea island, or more than the 27,038 bales of upland. Kentucky's crop of cotton is so insignificant that it is classed with other States than those comprising the rest of the group.

Southern States Rank High as Lumber Producers

STANDING out prominently among the resources of the South is its contribution to the lumber-consuming world. The South may be said to have three leading industries—lumber, cotton and steel. Of the three lumber is second only to cotton in the matter of dollars and cents. Ranking high among the lumber-producing sections of the United States, being a locality in which conservation of timber, perhaps, has not been adhered to more than in other regions, but by reason of a vast visible supply, standing well near the top of the ranks of future production, the South to-day is contributing a lion's share of the aggregate footage of lumber consumed in the Central, Southern and Eastern States, as well as sending millions of feet overseas every year.

COTTON PRODUCTION STATISTICS FROM MOST RECENT GOVERNMENT GINNER'S REPORTS*

States	Upland Cotton Bales	Sea-Island Cotton Bales	Linter's Bales	Total
Alabama	1,012,966	.....	60,700	1,073,666
Florida	27,038	28,047	2,500	57,585
Georgia	1,865,624	56,722	118,000	2,040,346
Kentucky†	.....	.....	.....	.....
Mississippi	898,414	.....	60,400	958,814
Louisiana	333,908	.....	20,622	354,530
Tennessee	286,525	.....	32,250	318,775
Total production	4,424,475	84,769	294,472	4,803,716
Average weight per bale (approximate)	500	390	510	.....
Average price sold (approximate)	11½c	25c	6c	.....
Prices range for season	8⅝ to 12½c	18c to 30c	3½c to 8½c	.....
Total valuation	$248,876,718.75	$8,264,977.50	$9,010,843.20	$266,152,539.45

*There is yet to be ginned of the present crop about 5 per cent.
†Kentucky is classed in with other States, the production of that territory being insignificant.

Supply Is Abundant

The foregoing being true, it is not to be wondered at that advocates of the Greater South point with pride to its vast buying power in the commercial world. While it is true that in the river sections of the Southern States difficulties arise which must be considered when comparing the natural advantages of other sections, nevertheless, the South, taken as a whole, must attribute much of its financial showing to the fact that the activity in the lumber industry is at its height. There is a visible supply of timber in the South to last many years yet, if proper conservation is practiced, and with the Federal Government co-operating with timber owners, teaching them how to take from the forest, it seems likely that the people south of the Ohio River will not see the forests depleted for several generations.

Probably the South is more prolific of wood varieties than any other section of the United States. Two of the more common are yellow pine and cypress. Of the yellow pine there are two kinds—long and short leaf, the distinction between them being that the former has greater tensile strength than the latter by reason of its longer fibers. Yellow pine goes into the construction of building and manufactured articles where strength is a factor. It is harder and more durable.

Much Yellow Pine

Yellow pine of both grades go into building construction in large quantities. Certain grades go into the manufacture of boxes. Cypress found along the Gulf of Mexico and the lower Mississippi is used for nearly every purpose. Being known as "the wood eternal" it comes in as a building material in large quantities and by a burning and scouring process finds a place high in the estimation of users of interior finish, since the grain is thereby given in relief.

Kentucky and parts of Tennessee are in the hardwood region of the South. Red and white oak are found there in large quantity and as to their uses, one has but to look on every side to find them. Poplar and cotton, as well as sycamore are used considerably in interior finish, boxes and for pattern making to some extent.

The Atlantic States have another grade of pine, known as North Carolina pine, which is quite similar to long-leaf yellow pine, while Georgia has a species all her own, very hard and finding a place in all the uses to which long-leaf yellow pine generally is put. Some sections of the southeast produce walnut and other fine finishing woods, but the supply of these is more or less limited.

The consensus of opinion at the present time, according to several leading figures in the lumber industry of the South who are in a position to know, is that the lumber industry is on the eve of a period of prosperity, the equal of which has not been approximated in several years. Granting that this is true, other lines of business should prosper. The man who sells automobiles should find fertile fields for his selling campaign during the coming year. True, the sections along the Mississippi have suffered from floods, but that is no unusual thing and this year's inundation has been less severe than on several other occasions.

After a period of depression extending over the last year and a half, building activity has taken on a new impetus and in consequence new mills, bigger production plans and greater selling campaigns in the lumber industry of the South are the order of procedure. The good showing of the early part of 1914 was robbed to offset a declining market after the first

(*Continued on page* 478)

The FORVM

MORE IDEAS ON BODIES—BEAUTY AND COMFORT SHOULD GO HAND IN HAND—THE CASE FOR MAGNETO IGNITION

Efficiency, Beauty and Comfort the Three Ideals

By Charles H. Tuft
Daniels Motor Car Company

IN Mr. Schipper's article on Body Discomfort in THE AUTOMOBILE for Feb. 3, I believe Mr. Schipper has summed up the situation by his statement, "It is recognized that it is impossible to turn out the bodies of stock cars in the same manner as a tailor fitting suits of clothing.

Thinks Comfort Not Forgotten

I do not think that in the race after beauty of exterior, the designer lost sight of the comfort of the interior. I am sure that the majority of designers have kept this matter in mind. That some have been more successful in their efforts than others, goes without saying. There are, as the article in question states, "a multitude of things that go to make a car comfortable." As a rule, the layout of the chassis governs. The steering gear must be mounted on the frame at a place very often determined by the location of the spring links, engine legs, starter, generator, magneto or water pump, etc.

Cylinders of V-type, multiple-cylinder motors, the tops of which overhang near the frame, largely determine the position and angle of the steering gear. The unit power plant largely determines the location of pedals, hand brake and gearshift levers. Pedals and hand levers may be so designed as to make them accessible and convenient for use, but the fact remains that their fulcrums are fixed by the location of the power plant and that their efficiency to a certain extent controls their design.

Comfort Should Follow Beauty

It is no more than natural that the mechanical features and performance of a car should determine its popularity and success. Of what advantage would the most handsome and comfortable body be were the chassis faulty? Who would be satisfied with a beautiful exterior and comfortable interior, should his car lack the power and speed to take him where he wanted to go and come?

Comfort, however, should be the very next consideration after efficiency and beauty, for were it a choice between beauty and comfort in a car after its efficiency were assured, I believe the public would demand the beauty. An owner takes more or less pride in his car, and if he is assured of its beauty and gracefulness of lines, in the eyes of others, minor discomforts, if such he may have, are more than made up for. I do not believe there are many cars of later design and average price that are uncomfortable, in the real sense of the word, to the driver. There is no doubt that there are some that are inconvenient of entrance to the driver's seat, but the buyer has demanded fore doors, the center control and the individual front seat, and these have all added more or less to his inconvenience in entering and leaving the driver's seat.

A few cars have been made with adjustable front seats and sliding steering wheels, but the majority of manufacturers have encountered no public demand for a radical change in the driver's compartment. Cars have been made in which the driver has been given the extra inch or two of the surplus space which Mr. Schipper speaks of in the tonneau, with the result that the driver uses a cushion at his back and extension pads on his pedals.

I do not believe it possible to standardize any set of dimensions pertaining to the driver's seat and the location of the various controls. There are too many variables that enter into the matter. If 9 in. were accepted as the proper distance from the bottom of the steering wheel to the top of the cushion, a thick cushion with light springs and plenty of hair would allow the driver to sink 3 or 4 in. and the wheel is then too high. If 19 in. were accepted as the proper dimensions from the pedal pads to the front of the front seat it would depend altogether on the depth of the cushion (the distance from the front seat to the upholstering of the back), whether the pedals can be operated or not. The driver must have his seat "back him up" when he applies his pedal or compresses his clutch spring. He also must apply his emergency brake, in emergency, with a pull from the shoulder and a straight arm. To do this he must necessarily lean for his lever, and in this case the pedals, both pushed down, must afford the support to pull against. A great deal of the driver's weariness comes from the friction between his back and the upholstering, due to the workings of the springs in the seat cushions. Thick soft cushions, especially, have this tendency. One would tire very easily in a Turkish rocker were he continually bouncing up and down. The only way to overcome this is by having the back upholstering move with the seat, and I understand that patents have been taken out covering this form of seat construction.

Individual Tastes Differ

The writer was connected with one concern that specialized in custom-made cars and hardly two cars ever went out alike, in regard to the location of the steering wheels, pedals, levers and location and height of the front seats. Every customer wished a change of some respect made. Some wanted to sit on the floor, others wanted to sit up in the air. Some would want the steering wheel up against their bodies, others wanted to drive with the wheel at arm's length. We had a hundred and one different steering column brackets until we adopted the ball joint universal bracket similar to the Minerva. Pedals were made in numerous lengths and hand levers bent into every conceivable shape.

Must Consider Human Limitations

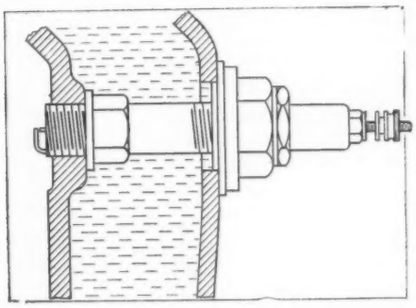
I am a thorough believer in standardization wherever possible, but as long as human beings go on varying in stature, as they have a habit of doing, I do not believe that any standards for comfort that may be adopted will meet with the approval that would be expected.

To Avoid Plug Trouble in Racing Engines

By J. E. Schipper

ALTHOUGH they were nearly all able to overcome the difficulty as the season wore on, at the start of the racing program of 1915 the major motor trouble was the difficulty of obtaining spark plugs that would stand up under the punishing conditions of high temperature prevailing in modern engines of high efficiency.

It appeared, afterwards, that the temperature was the chief cause of the trouble, and that those engines in which the spark plug was in a good position for cooling were the easiest to equip with plugs of sufficient durability.



The accompanying sketch shows an idea for providing the plug with a maximum of cooling. It is suggested that the plug boss be cast in the cylinder wall itself, instead of forming a lug connecting the inner cylinder wall with the water jacket, and that the plug body be screwed directly into the cylinder. To allow this plug body to be water-cooled direct, it would need to be longer than usual, and it would, of course, have to be put in before the water. When the plug was screwed home with a tube spanner, a nut with a soft gasket would seal the orifice in the water jacket wall.

Obviously, a plug inserted in this way, having a special, long body to suit the design of the engine, could not be changed except by first letting out the water. To combat this it is suggested that the insulator might be detachable. There are some obvious difficulties, in the details of the plug, but it seems that the efficiency of the cooling could scarcely be bettered and the idea is one that might be worth elaboration.

The Case for the Magneto

By N. J. Hart

THERE is a very distinct advantage in having an increasingly hot spark as the engine speed increases, because such a hot spark has the property of being able to clear fouled plugs and to keep clean ones from fouling up.

There are magnetos that are capable of maintaining perfect ignition at lowest possible engine speeds under all conditions. In fact, so efficient are these instruments that they will furnish absolutely perfect firing to engines revolving so slowly that not enough energy is stored up in the rim of the flywheel to carry the pistons over the next following compression point, and if it were not for the momentum of the rolling mass of the car pushing the engine over the engine would stop.

The storage battery was discarded for ignition purposes immediately the magneto was brought to its present state of perfection because of the fact that the ordinary driver could get the very best possible effort out of his engine when magneto-equipped for the reason that the current and voltage increase and decrease with the speed of the engine. This had the much desired effect of doing away with the necessity of pulling and hauling the advance and retard mechanism at every change in road condition or speed. Drivers had some comfort then. Much manipulation of the battery-ignition advance lever is absolutely necessary if one is to get any kind of power out of the engine.

Let us face the truth. Battery ignition systems cost less than magnetos and this is the prime and only cause of the adoption of methods abandoned long ago in Europe as unsatisfactory. The battery is necessary on a modern car to supply current for lighting and for starting the engine and when used for ignition purposes does not give the ideal spark for starting which is so much boasted about by the supporters of this system and for the following reason: When the starting switch is operated there is a terrific "inrush" of current into the armature of the starting motor and as the capacity of the battery generally supplied is limited first by weight, then by size, and last but not least, by cost, there occurs an immediate drop in voltage of at least twenty-five per cent, and this drop is much greater in cold weather. Coils to operate successfully must be wound for the voltages on which they are intended to work and it is therefore a fallacy to imagine that a fat spark when starting is at all possible in the face of the drop in voltage at the battery terminals when starting motor is called into action.

Battery Ill Kept

Another point to be considered is the following: The storage battery in the hands of the novice is rarely kept in even a semblance of good condition and as the battery is the "weakest link" in the most vital part of the car, it seems to me to be like "placing too many eggs in one basket."

In a great measure the carbonizing of the engine and deterioration of the exhaust valves can be laid to the door of the weak and inefficient ignition and not to bad gasoline or cylinder oil as claimed.

Misleading Switches

Another point is that the switches of the battery system have had two points indicated on their faces, the word "Bat" at the starting point and "Mag" at the running point. People have been under the impression that they have been buying magneto-equipped cars and that the word "Mag" signified magneto, when as a matter of fact, none of these cars equipped with these switches had even a place on the engine where a magneto of any kind could be installed. Even if a magneto were installed it could not be operated *with that kind of a switch* in the circuit.

RENE THOMAS, winner of the 1914 *Indianapolis race, who will drive a Peugeot car in all the leading American track races during the coming season. Thomas, who is free from military obligations in Europe, has made arrangements with the Indianapolis Motor Speedway to rebuild one of their Peugeot racing cars and will make his first appearance in the* 300*-mile race on May* 30. *It is expected that Thomas will sail from France about the middle of March and will be in Indianapolis on April* 1.

The Rostrum

How a Gear Pump Operates

IN THE AUTOMOBILE for Feb. 24, a description of the action of the gear pump was given which was incorrect, owing to the inversion of the intake and exhaust sides. The diagram shows the true action which is as follows:

When the pump is stationary it is full of oil and all the small spaces between the teeth of the gears are filled likewise. Regarding those teeth which are on the outer edges furthest from the center of the pump, it is easy to see that the small quantities of oil between the teeth are shut in by the edge of the casing. This is equivalent to saying that the space between each pair of teeth acts like a small bucket or pocket.

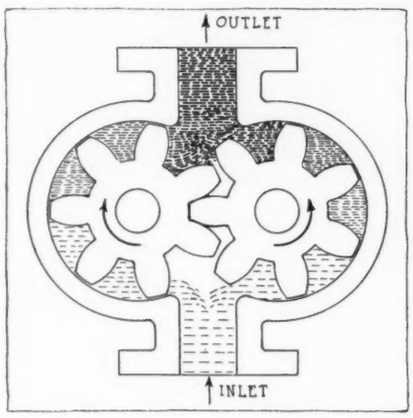


Fig. 1—Diagram of gear pump action

Now, if the gears start to turn, each tooth space as it leaves the suction side picks up its "charge" of oil and carries it round. When the point is reached where the two gears mesh together, the oil lying between the teeth is squeezed out. Thus as each successive pair of teeth meets, the effect upon the oil is the same as the downstroke of a minute plunger pump. Normally the teeth spaces are kept filled with oil and every time the teeth meet, the oil is expelled by the other tooth filling the gap.

The limit of pressure which a gear pump can create is determined by the relative areas of the teeth and of the clearance space surrounding the gears. The oil that is thrown out on the discharge side can leak back to the intake side by flowing across the faces of the gears. The amount of oil discharged varies directly with the width of the teeth, thus if two pumps are of the same size, save that one has double the width of tooth, then the larger should pump twice the quantity of oil per minute that the other will do at the same speed. This means that by making the gears wide we can create a very great pressure; indeed, there is practically no limit to it.

Lauds Studebaker Service

Editor THE AUTOMOBILE:—In the last issue of your paper I noticed a very good article entitled "Trend and Possibilities of Automobile Design," and my attention was especially attracted to the latter part of this article regarding the cost of maintaining automobiles. It seems to me, as a new owner and operator, that the different automobile companies should aim to operate their mechanical departments so as to give cheerful service and service that is not only good, but that which is honest and reasonably priced. In other words keep the customer so well satisfied with his car that he will be a booster instead of a knocker.

The scheme of the Studebaker people is an excellent one and while it does not go far enough—the first six months' use being the best life of the car—it is the right spirit for the manufacturer to have toward the operators and cannot help but make them satisfied customers. The typewriter folks keep their machines in repair for a year and I guess the automobile people are coming to the year themselves, gradually creeping up to it. I believe that if the auto folks would offer a year's upkeep of their machines with the price of the machine the increased sale of that particular machine would soon indicate very clearly the worth of the offer. I know people who are ten times more able to own a machine than I am, but who do not own one because of the excessive charges for repairs and maintenance of the machines. I know a former operator of a Ford who found the cost of keeping the machine more than he had been led to believe it would be, and now preaches the doctrine of hiring. He says you can afford to hire a machine for an occasional ride and rid yourself of owners' troubles and have a free mind. He, like thousands of others, was robbed by the repair folk. I think this form of robbery is doing more harm to the industry than even faults of the machines.

Your paper seems to be going after such practices as these and I hope you will keep up the good work and educate the manufacturers up to the idea that they must satisfy the customer if they expect to continue in the business. W. M.

Washington, D. C.

Prolonging the Life of Automobile Tires

Editor THE AUTOMOBILE:—From time to time various schemes have been suggested for equalizing the wear on tires, most of them aiming apparently to have the tires all wear out at the same time, which, to most of us not blessed with unlimited money is a calamity rather than a saving.

A plan which the writer has tried out very successfully and which he has not seen advocated elsewhere is here given. Assuming the average car with four tires on the wheels in various stages of wear and one new one as a spare, take off the right rear tire and carry it as a spare, replacing it with the new tire. Run the car 1000 miles and then move this tire to the left rear wheel, putting a new tire on the right rear. At the end of the next 1000 miles move the left rear to the left front, the right rear to the left rear and put another new tire on the right rear. After 1000 miles more repeat the process, keeping the tires moving from wheel to wheel at each 1000 miles, moving them around the car in clockwise direction. There are a number of advantages in this which are not apparent at first thought. The rear wheels naturally are the hardest on tires and of these the right rear will generally get more wear than the left due to the fact that the left usually has the better part of the road to travel on. Therefore the new tire, which is best able to withstand the wear is put on the right rear each time. When it is moved to the left rear the direction of wear is reversed. This is beneficial to the tire and is of advantage on a non-skid tire as the gripping portions presented to the road are the opposite of those we

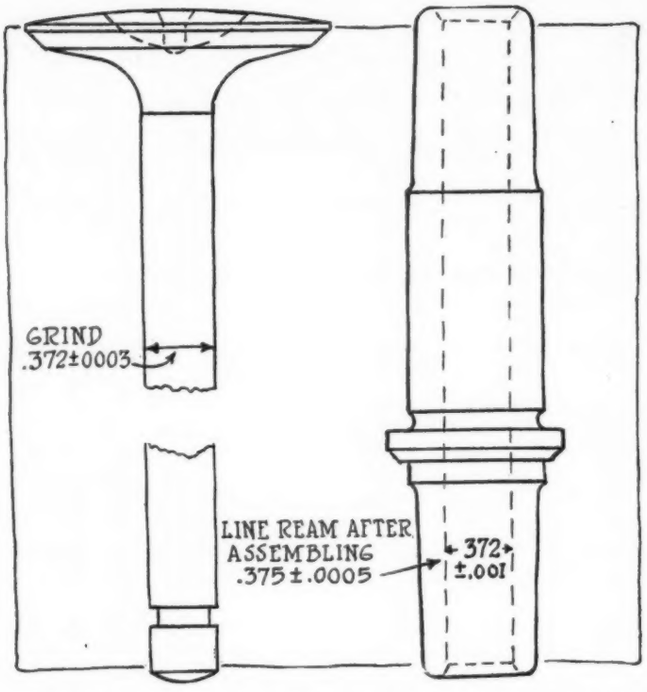


Fig. 2—Details of Continental 7-H model motor valve and valve stem guide, illustrating clearance

ran on the other wheel. To those who use reliners it may be said that the time to insert the reliner is when the tire is moved to the front wheel after running 2000 miles on the rear wheels.

The writer has tried this out on several of his friends and has yet to see a car with tires adequate to its weight which has not given greatly increased mileage per tire, in every case the tires running over the 4000 miles necessary to complete the cycle. On one car on which the owner formerly considered himself lucky if he got 2500 miles from a tire, the tires now give better than 4000 miles. To get the best results non-skid tires should be used and reliners will give additional mileage when the tires are moved up to the front wheels.

The writer's experience with reliners has been unsatisfactory when used on rear wheels or in new tires and he does not believe they should be so used.

If after a season's trial it is found that the cars are averaging well over 4000 miles (on one car on which this plan has been tried out they have averaged over 6000) the change can be made at 1100, 1200 or more miles—the whole object of the scheme being to get the utmost of wear from each tire, to have it about completely worn out by the time it has made a circuit of the four wheels and to have the expense for tire renewals come regularly and one at a time instead of irregularly and sometimes in bunches.

While on this subject why not give us a well worked out table showing the actual inflation pressures for tires of different sizes and under different loads, giving actual load weights and not empty car weights which plainly mean nothing when taking a seven-passenger car and a runabout with the same size tires. There is no use carrying a greater inflation than is necessary and proper for the weight the tire has to support, and, if we could get a really well worked out table of this sort, it would add to the life of the tires and to the comfort of the motorist. Most tires are either over or under inflated and either one is injurious. If such a table has ever been published it would bear repeating, especially if it gave bona fide pressures for bona fide weights under complete load. In these days of power pumps it is not necessary to allow 10 to 20 lb. for "that tired feeling" which comes from hand-pumping and this is just what many of the tire companies do in their tables of recommended pressures.

Larchmont, N. Y. M. C. C.

Bright Brass Dipping Solution

Editor THE AUTOMOBILE:—We understand that there is an acid solution or bath used by brass workers, clock makers and others in which brass parts may be dipped and the brass will not be affected by the acid, which will, however, remove all dirt, grease and tarnish and the brass will come out of the bath bright and clean. Can you give us the formula for this acid bath and instructions for its use, advising us also whether it must be kept in lead or glass containers?

2—Will you also kindly advise us what is considered good practice in the way of clearance between valve stems and their guides? For instance, in a used motor where the stems and guides are worn, assuming the stems to have been originally 0.375 diameter, new guides are fitted, or if the guides are integral, they are reamed out oversize and bushed, and in either case the finished hole is made 1/64 undersize, or 0.359. What size then should the stems on the valve be ground to—in other words, how many thousands under 0.359 to allow proper clearance when the valves are heated up and yet make a strictly first-class job? Should exhaust valves and inlet valves both have the same stem clearance in the hole?

Larchmont, N. Y. L. MFG. CO.

—The parts to be cleaned are first dipped into a solution of hot lye and then dipped into what is known as a bright brass dip. This is made up as follows: Two parts sulphuric acid to one part nitric acid with a tablespoonful of salt to each 3½ gal. of acid. Care must be used in mixing. Put the sulphuric acid in a jar first, then add the nitric acid. Let this stand until it stops working or fuming, then add the salt. The parts to be dipped should be dipped first into the hot lye solution and then into the acid solution. Immediately after the acid dip the parts should be rinsed in cold water and then given a second dip into the acid, and then into the cold water to rinse them off. After this they should be dipped into very hot water and thrown into sawdust to dry.

2—Practice on clearance between stems and guides is shown in the accompanying illustration, Fig. 2, which details the 7-H model Continental motor valve and valve stem guide. The dimensions apply to both intake and exhaust. It is the practice of the National Co. if a finished hole of 0.358 to 0.360 is indicated, to use a valve stem diameter of 0.355 or 0.356. This clearance would be suitable according to the National company for both inlet and exhaust. The Northway company states that the valve clearances vary between 0.0025 and 0.004, depending on the design of the exhaust port. The Buick Motor Car Co. allows a clearance of 0.0015 to 0.002 on the intake and 0.0025 to 0.003 for the exhaust.

Carbon Monoxide a Poisonous Gas

Editor THE AUTOMOBILE:—What are the chemical composition and the chemical and physical properties of the gas called Petromortis supposed to be deadly?

2—Are there any unusual atmospheric conditions conducive to its formation?

3—Could theoretically imperfect carburetion or ignition cause the generation of the gas?

4—Could the improper composition or condition of gasoline or lubricating oil cause the generation of the gas?

5—Is the gas liberated in such concentration that ordinary ventilation of the garage will not prevent asphyxiation?

6—Is the presence of the gas in harmful proportions in the garage detectable by the ordinary human senses?

7—Is the harmful effect of the gas immediate or might its effect be noticed a given length of time after inhalation?

8—In general does unconsciousness result so quickly that the victim could not reach the open air after realizing approaching danger?

9—Would access to open air be sufficient to relieve all harmful results in case open air was reached after discovery of the presence of the gas and its inhalation?

10—Are the physical and chemical properties of this gas well enough known so that a simple means of detecting its presence in the garage is possible even though its accidental generation could not be prevented in a practical manner? C. M. C.

Fort Canby, Wash.

—The gas which has the deadly effect is carbon monoxide. This is not only a suffocating medium but is also a poison. Carbon dioxide is a deadly medium, too, but only in that it is a non-supporter of life, although not a posion.

2—No.

3—Yes

4—Yes.

5—With very bad or incomplete combustion the carbon monoxide ingredient can be so large that it will cause bad effects even with average ventilation, but it will hardly be fatal except in an entirely enclosed room, or a room in which there is no air circulation.

6—No.

7—Headache and pain in the eyes are felt by some people in the presence of the gas, but not by all.

8—There may be no direct warning except a drowsy sensation which quickly deadens the senses of the victim.

9—Yes.

10—The stinging sensation in the eyes and headache is usually sufficient warning.

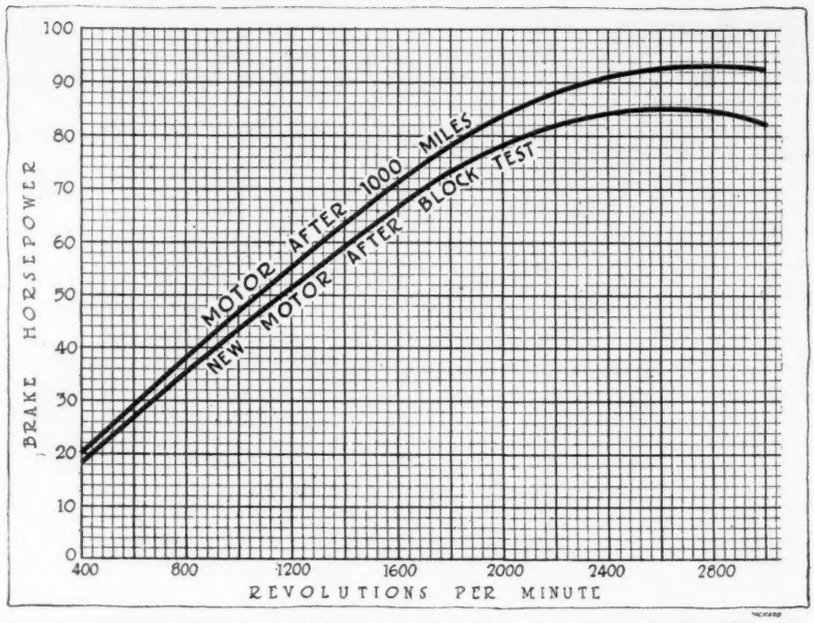


Fig. 3—Horsepower curves of Packard twin-six motor when new and after 1000 miles

Explanation of Systems of Ignition

Editor THE AUTOMOBILE:—In your list of technical specifications for passenger automobiles published in the issue of THE AUTOMOBILE of Dec. 30, 1915, the systems of ignition are given as single, dual, double, 2 point and duplex.

Will you kindly furnish me with the correct definition of each of these terms? W. H. R.

New York City.

—Single ignition is where there is one source of current and one set of spark plugs.

Dual ignition is where there are two sources of current and one set of plugs, the systems being independent in every respect until the distributor mechanism is reached. In this point, including the distributor, high tension leads and spark plugs, the one set does for both systems.

Double ignition employs two current sources and two entirely independent systems, either one of which may be used independently of the other. Both may be used at the same time, but perfect synchronism will not be attained unless there is some special arrangement for attaining it. The double system means that there are two absolutely independent ignition systems.

Two-point ignition is where two sparks occur in the cylinder at the same time; generally this is done by the use of a double distributor, but recently there have been series spark plugs put on the market by means of which a single spark ignition is made into a two-point system by simply connecting the plugs in series.

The duplex system is where a coil is used in a battery circuit and connected to the primary of the magneto. This gives a hot spark at low rotative speeds and is only intended as a booster current for starting. After the motor is running at normal speeds the circuit is the same as the single magneto system, the duplex cil not being in use.

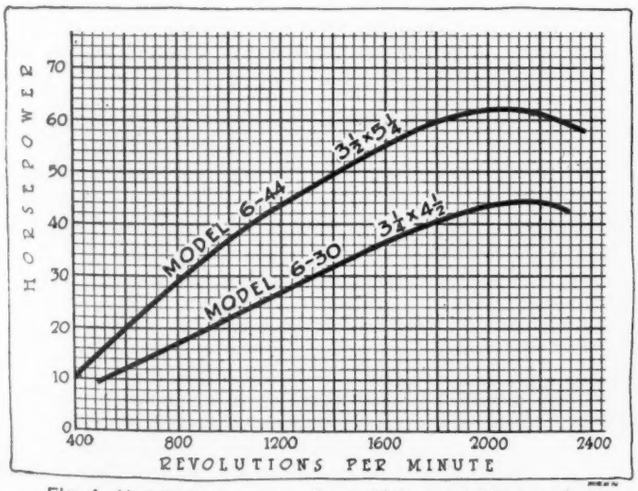


Fig. 4—Horsepower curves of two high-speed Moon motors

Horsepower Output of the Moon Motors

Editor THE AUTOMOBILE:—Will you kindly publish the horsepower curve of the Moon model 6-44 and 6.30 motors?

New York City. J. E. S.

—These horsepower curves are shown in Fig. 4 and are illustrative of the typical up-to-date high-speed practice.

Horsepower Output of Packard Twin Six

Editor THE AUTOMOBILE:—Will you kindly give the horsepower curves of the 1916 Stearns-Knight eight and the Packard twelve? G. A. S.

Philadelphia, Pa.

—The horsepower curve of the Stearns-Knight eight is not available. That of the Packard twelve is shown in Fig. 3. It will be noted that two curves are shown of the Twin Six Packard. The lower curve represents a comparatively new motor well worked in on the dynamometer, while the other curve represents the power that it is possible to get out of a motor when well worked in by a lot of road service.

ACCESSORIES

K-P Aluminum Pistons

EACH set of K-P aluminum alloy pistons for Ford motors has a complete equipment of properly fitted rings; the pistons are of standard size and are ready to slip into the cylinders. The rings are the K-P, made by the same concern; they are of the three-piece type with all joints blocked by the solid metal of the jointless sections of other parts, and the ends are so locked that they cannot warp up and score the cylinders in case of overheating, the makers state. The pistons sell for $26 per set of four. —Keys Piston Ring, Inc., St. Louis, Mo.

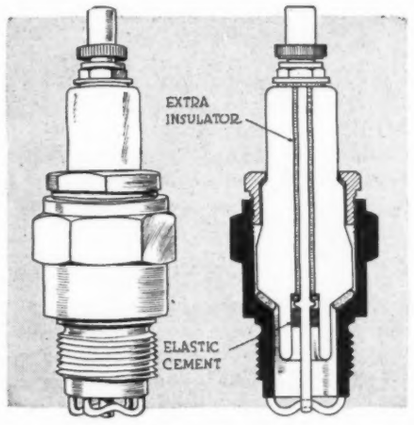
K-P aluminum pistons for Ford motors

Jumbo Spark Plugs

The Jumbo Jiant is the leader of this line, which comprises three other plugs, the Jumbo Regular, Junior and Ford Special. The Jiant is designed for the utmost durability in service on high-speed, high-compression motors as well as in all heavy-duty types. It is made in S. A. E. ½-in., metric and S. A. E. long sizes. The Regular is made in S. A. E., ½-in. and ½-in. long sizes. The Junior is for medium-speed, medium-compression motors and is made in S. A. E., ½-in. and special motorcycle sizes.

Some of the advantages claimed for the Jumbo construction, illustrated herewith, are: Terminal will fit any connection; extra insulator insures spark in case porcelain is cracked or broken; asbestos washers allow for expansion and prevent leakage; elastic cement strengthens lower part of insulator and prevents compression escaping around electrode; massive nickel-alloy points gives hottest possible spark, prevent pre-ignition at points and will not burn off; two large shell electrodes fastened at both ends cannot be bent or twisted out of place; downward slope of electrodes from points of contact allows oil to run off, thus preventing fouling.

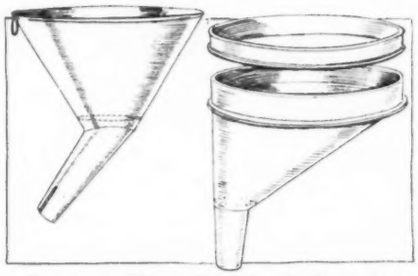
The Jumbo Jiant sells for $1.25; the Regular for $1; Junior for 75 cents and Ford Special for 75 cents.—Wales-Adamson Co., Chicago, Ill.



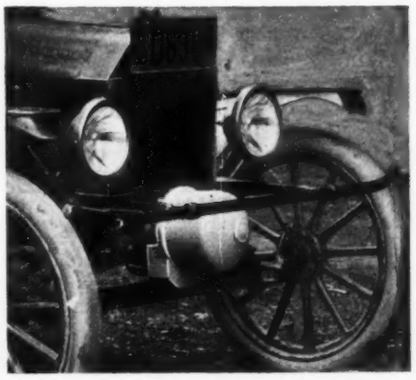
Jumbo spark plug, showing construction

Dover Funnel for Cadillacs

Designed especially for Cadillacs, this funnel has the spout set at an angle so that the filling of the oil reservoir in the eight-cylinder car is greatly simplified. Capacity, 1 qt.; top diameter, 6½ in; height, 7½ in; outlet, 1 in. The funnel is of heavy pressed steel, copper plated, and is fitted with brass strainers. The Kompact, the other funnel illustrated, is of the offset type, one side being vertical and directly in line with the spout, so that it is easily used in places where there is little or no room at one side. The top has a removable hoop to hold a chamois strainer, and a fine brass strainer is provided. Capacity, 4 qt.; top diameter, 9½ in.; height, 9½ in.; outlet, ⅞ in. Price, Cadillac, 50 cents; Kompact, $1.25.—Dover Stamping & Mfg. Co., Cambridge, Mass.



Two new Dover funnels. Left is especially for Cadillac cars. Right is the Kompact offset type for general purposes



Mounting of motor-generator used in Eveready starting and lighting system for Ford cars. A flexible coupling is used

Eveready Starter for Fords

The Eveready is a one-wire electric starting and lighting system for Ford cars, the motor-generator being directly connected to the crankshaft by a flexible coupling. It runs at engine speed, causing no drag on the engine and has no chains or sprockets. The starting motor acts as an auxiliary flywheel, reducing vibration and making it possible to throttle down to 3 miles per hour on high gear, according to the maker.

Besides the motor-generator, the system comprises a special 12-volt storage battery, lighting and starting switches and wiring. The battery is carried on the footboard, flat against the heelboard of the front seat.

To start the car, the spark lever is shifted to the full retard position, which sets the starter spinning. When the spark lever is advanced as the engine attains the necessary speed the dynamo automatically begins to regulate and charge the storage battery. The system is so simple that it can be installed in a few hours without drilling or making any changes in the engine or car.—American Ever Ready Works, Long Island City, N. Y.

Blackmoor Curtain Opener

A suitable bracket is attached to the door so that the storm curtain opens with the door. The bracket is adjustable to any make of car and can be quickly removed when not in use. Curtains to be used with these brackets are furnished with all makes of cars. The price for the opener is $2.50 per door.—Dayton Top Improvement Co., Dayton, Ohio.

Outlook Windshield Cleaner

In this device, an adjustable wiper for rubbing off a section of the windshield glass is mounted in a suitable bracket and can be operated easily by the driver. It is finished in black or nickel and the wiper itself is made of rubber. It lists at $1.50.—Outlook Co., Cleveland, Ohio.

Universal Radiator for Fords

In THE AUTOMOBILE for Feb. 10 it was stated that the Universal radiator for Ford cars was of heavy steel, well enameled and finished. This should have referred to the Universal hood, as the radiator is made in black enamel and nickel.

The Automobile

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Good Lighting

WHAT good lighting really is is well explained in the S. A. E. paper which is concluded in this issue of THE AUTOMOBILE. It is a careful analysis of the *details* which affect the whole difficult subject. Mr. Clark has explained, both in exact terms of scientific units and in simple language also, what sort of a beam and what sort of general illumination is necessary in an automobile headlight to produce a safe driving light which will not exercise a dazzling effect upon other users of the road.

The fact that Mr. Clark favors a particular method of producing a lamp to suit the conditions is beside the case. The lamp he describes may be the best possible, and there may be many other means for obtaining the desired light. The important thing is that we have here a full and easily understandable definition of the things which a lamp ought to do.

The requirements once stated thus clearly, the problem of devising lamps to suit them is facilitated greatly, the problem of legislating so as properly to control lights ought to be rendered easier, and the way out from the present chaos brought within sight.

Even supposing that Mr. Clark's conclusions are capable of destructive criticism, suppose even that they were proved wrong in some respects, we still have before us the proper way to attack the problem. A proper system of gaging light and what it does is three-quarters of the battle for a sensible and simple means for obtaining the results which everyone desires.

It may be recalled that an effort to establish some sort of automobile standard of lighting was made by a German scientist in 1913 and his suggestions were given in THE AUTOMOBILE for July 17, 1913. Since then no more has been heard of the idea from that source and the professor had not worked it out to nearly as fine a point as Mr. Clark has now done.

Strengthening the Grip

THE manufacturing conditions of Europe are such at present that the whole world has to look to America for automobiles. Large parts of that world, outside Europe itself, offer wealthy and prosperous markets; ready money markets where the American manufacturer has no work to do in selling his product.

Simultaneously, the domestic demand is at least as great as the supply. It is difficult to find automobiles for shipment overseas, so urgent are the calls from domestic dealers.

The condition prevailed all last year, but it was only in the late fall that American automobile manufacturers showed signs of appreciating the facts of the case.

There is one aspect of it that is still liable to be neglected, and this is that when demand exceeds supply for any commodity, the price is raised automatically. The value of an article in ultimate terms is the price that those wanting it are prepared to pay. This means that the overseas markets which cannot get automobiles from anywhere except America are able and willing to pay handsomely for them. The foreign markets were never conditioned so advantageously to the American manufacturer, and it is safe to predict that they will remain in the present state not longer than for two years after the conclusion of the war. This gives America not less than three years and possibly a little longer to make the best of the opportunity to establish a worldwide trade on a firm and lasting basis.

Manufacturers of all kinds of goods are getting so strong a hold on South America that they will be entrenched against any recommencement of European exportation. Instead of being offensive they will in future be defensive, or, in other words, the tables have been turned in every country in the world. The proportion of America's automobiles being exported, even including all the war orders, is a vastly smaller percentage of the total output than it ought to be.

The overseas markets are not to be held without effort. Just now it is easy to sell anything to countries which are stripped of their normal European supply, but this easiness will not persist after the war. To pay the costs of warfare Europe will be forced to give far more attention to her export trade than ever before, and to retain the markets now so wide open, America must be prepared to meet competition of the keenest kind.

Court Issues Injunction Against Standard Welding

Prohibits Manufacture and Sale of Demountable Rims Held To Infringe Perlman Patent—Hoped-for Adjustment of Royalties and Damages Not Accomplished

NEW YORK CITY, March 8—An injunction was issued to-day by the U. S. district court for the Southern district of New York by which the Standard Welding Co., Cleveland, Ohio, maker of a large proportion of the demountable rims used on automobiles, is prohibited from further manufacture and sales of such rims. The injunction is the result of a suit brought by Louis Perlman, New York, against the Standard Welding Co., charging infringement of Perlman's basic patent on demountable rim construction and applies to this type of rim only.

This court action ranks second in importance to the Selden patent decision, in that it is believed to affect the manufacture of the majority of demountable rims. Stopping production of a large percentage of demountable rims will have serious consequences with many car concerns, and may require using clincher or quick-detachable types. It is impossible at this time to forecast the consequences.

Previous to the granting of the injunction conferences were held with the object of effecting a settlement by the payment of royalties and damages, but it is reported that royalties asked were too high and negotiations failed.

The court of appeals denied the Standard Welding Co.'s petition for a rehearing based on the contention that Perlman's alleged date of invention is wrong, and that his patent is invalidated by the Tillinghast patent, which is alleged to be of prior date. The petition also cites a decision by the court of appeals of the District of Columbia, alleging that it definitely limits the breadth of the claims in Perlman's patent so that they do not cover the Standard Welding construction.

A motion by the Standard Welding interests, to include in the mandate a clause in regard to the right of the district court to suspend the injunction upon sufficient cause being shown and after due notice, was also denied by the court of appeals.

The serious consequences to the automobile industry of the enforcement of the injunction may be realized when it is considered that over 700,000 of the cars to be made this year may use demountable rims and that a large percentage of the output is furnished by the Standard Welding Co.

The Standard Welding interests state that Perlman's demands are exorbitant, and that, while they are willing to pay the inventor a reasonable sum and a just royalty on future manufacture, they cannot meet the terms he names at present.

Perlman's contention is that his claims are reasonable, and that, as he has consistently maintained, he seeks an equitable, fair and honorable adjustment for all concerned.

Suit Filed in 1913

Perlman filed suit against the Standard Welding Co., Oct. 7, 1913, in the U. S. district court for the Southern district of New York, charging infringement of his demountable rim patent No. 1,052,270 issued on an application filed June 29, 1906, which was a continuation of and substitute for an application filed May 21, 1906. Perlman's idea, he said, was to patent "a wheel whose demountable rim is bodily detachable from its fixed rim and felly, means being provided for firmly and rigidly retaining the demountable rim on the fixed rim and felly while in use, such means at the same time being adapted to be manipulated for enabling ready, rapid and easy removal of the demountable rim when desired."

A decision in Perlman's favor was handed down by Judge Hunt Aug. 18, 1915, the court stating:

"Finally, Perlman's patent shows invention, completed by him in 1903. Two distinct features mark the invention: (1) The demountable rim combination with its locking means; and (2) the short-stem lug combination for clamping the tire to the demountable rim. The invention claimed was based upon a provision for a demountable rim which is loose on the wheel when applied, but is locked by locking means which may be unlocked and thereby may restore the loose condition before commencing removal. This same combination has been adopted by defendant and the same combination as disclosed and claimed in the patent in suit has been taken. Plaintiff disclosed to the defendant the patented invention before defendant began to manufacture demountable rims.

"The evidence requires the finding of infringement and the granting of an injunction and accounting in usual form."

A Decree Issued

In due time, early in September, 1915, an interlocutory decree was issued by the court in favor of Perlman, perpetually enjoining the Standard Welding Co. from further infringement of his patent and appointing a special master to determine the amount of damages.

An order was also issued at this time allowing the Standard Welding Co. to appeal to the circuit court of appeals, which was subsequently done, the decision of that court, upholding Judge Hunt in declaring the patent valid and infringed, being reported in THE AUTOMOBILE for Feb. 17, 1916.

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Standard Welding May Build Under Other Patents

CLEVELAND, OHIO, March 6—General Manager J. C. Manternach of the Standard Welding Co., the only official of the company in the city at present, said he thought that Perlman would not bring an injunction suit to enforce the terms of the recent rim decision, without giving some notification of his intention to the company or its attorneys. The decision, he said, gave him the right to bring such a suit, if he so desires.

Regarding the payment of royalties on rims already manufactured under patents said to infringe those held by Perlman, it is said that this will depend somewhat on negotiations with him.

Mr. Manternach did not care to indicate what course would be taken in the future, but indicated that some of the many patents held by the company might be used in place of those which have been adjudicated in favor of Perlman. This, however, will be a matter for future decision.

Locomobile Changes Truck Name

Commercial Vehicles of Locomobile Manufacture to Be Called "Riker" in Future

BRIDGEPORT, CONN., March 7—The name of Locomobile as applied to motor trucks built by the Locomobile Co. of America, this city, has been changed to Riker, the new name being a distinct recognition of the work of Andrew L. Riker, now vice-president of the company, and who has been in charge of engineering since the four-cylinder Locomobile car was brought out in 1902. Although the name Locomobile will be discontinued as applied to trucks, the Locomobile passenger cars will continue the use of the name Locomobile as they have done in the past.

Several reasons are advanced for adopting the name Riker for the trucks of this concern. Foremost is the fact that the name Locomobile is to-day associated with expensive, luxurious automobiles, manufactured in limited quantities. This fact contrasts with the motor truck which is a vehicle of business, and which is used because of its money-earning ability. As a truck-builder, Mr. Riker's experience goes back 16 or 18 years, when he built the Riker electric delivery vehicles, some of which are still in the service of B. Altman & Co., one of New York's largest department stores, and the Gorham Company, a leading New York silversmith. After being engaged in the manufacture of electric vehicles in Brooklyn, and later in Elizabethport, N. J., Mr. Riker was engaged by the Locomobile company to develop a line of gasoline cars, and brought out the first Locomobile four-cylindered car.

Although the name of the trucks has been changed from Locomobile to Riker, there will be no changes in the line of vehicles manufactured other than natural improvements that come from time to time. The Locomobile Co. of America stands back of the product as it did before the name was changed.

National United Service Co. Takes Over Arbenz

NEW YORK CITY, March 8—The National United Service Co., with headquarters in the U. S. Rubber Building, has taken over the Arbenz Car Co., Chillicothe, Ohio. The National United Service Co. is preparing to take over four other automobile concerns and has increased its capital from $150,000 to $1,000,000. It is planned to assemble the Arbenz car, three models of trucks, 1-ton, 1½-ton and 3-ton, and an agricultural tractor in the plants to be acquired in various parts of the country.

H. F. Vortkamp, Jr., is president of the company, the other officers being A. C. Hartho, vice-president and treasurer; C. V. Neal, second vice-president; and L. T. Gresser, secretary.

Pullen, in Mercer, Wins Ascot Speedway Race

LOS ANGELES, CAL., March 5—Pullen in a Mercer won the George Washington Sweepstakes, a 100-mile race, at the opening here to-day of the new Ascot Speedway. His time was 1 hr. 30 min. and 42 sec., or 66 m.p.h.

Burman in a Peugeot finished second and Cooper in a Stutz was third. Their time was 1:32:43 and 1:32:44 1/5 respectively.

Peerless Truck Profits $2,555,773

NEW YORK CITY, March 8—The Peerless Truck and Motor Corp. reports for the year ended Dec. 31, 1915, net profits of $2,555,773, after providing for the full year's interest on the company's notes, on which there only accrued one month's interest, deducting all interest charges of subsidiary companies and creating a special reserve account of $600,000. This is equivalent to 22½ per cent, earned on the capital stock.

The balance sheets of the subsidiaries show current assets of $5,611,780 and current liabilities of $1,391,587, leaving working assets of $4,220,193.

Buick Elects Officers and Directors

FLINT, MICH., Feb. 29.—Officers and directors for the current year of the Buick Motor Co., are the following: Charles W. Nash, president and general manager; C. S. Mott, vice-president; T. S. Merrill, secretary; James T. Shaw, treasurer; Floyd A. Allen, assistant secretary-treasurer; L. F. Oland, comptroller.

Sparks-Withington Trebles Capital

JACKSON, MICH.—At the annual meeting of the Sparks-Withington Co. the capital stock of the company was increased from $300,000 to $1,000,000, and it was decided to double the size of the plant.

J. Walter Thompson Co. Has Jeffery Advertising

CHICAGO, ILL., March 8—The J. Walter Thompson Co. will continue to handle the advertising business of the Thomas B. Jeffery Co. In THE AUTOMOBILE for Feb. 24, it was stated otherwise but this was an error.

New Company Will Cast Car Bodies

Officials of Aluminum Castings Co. Form $100,000 Co. for Body Specialization

DETROIT, MICH., March 8—The Castaluminum Body Co. has been incorporated here with a capital stock of $100,000 to build aluminum automobile bodies. Those interested in the new concern are Charles B. Bohn, Michigan manager of the Aluminum Castings Co.; Robert F. Dyer, assistant sales manager of that company, and Wm. A. Watts, sales manager of the Pantasote Co., Windsor, Ont. As its name implies, the new concern will manufacture automobile bodies constructed of cast aluminum, though the exact plans of the new organization are withheld for the present.

It will be remembered that the Pierce Co. has used cast bodies for many years and that Cadillac has just commenced to do so for closed cars.

Pierce Plant Closed

BUFFALO, N. Y., March 4—The whole plant of the Pierce-Arrow Motor Car Co. has been closed down, owing to the strike of the machinists. This throws about 6000 men out of employment temporarily. Officials of the Pierce company state that they preferred to close the whole plant rather than to endeavor to run with the machine shop closed to the unavoidable disorganization of the factory system.

Santa Monica Gets Grand Prix and Vanderbilt

SANTA MONICA, CAL., March 8—The Grand Prix and Vanderbilt Cup races will be held on the Santa Monica course this year. The struggle for the honor of promoting the two classics has been very keen. The decision of the Motor Cups Holdings Assn., which controls both the Grand Prix and Vanderbilt cups, not to allow these for competition on speedways, paved the way for road racing associations to make a bid for the classics.

Omaha Man Sues Automobile Manufacturer

OMAHA, NEB., March 6—If the $100,000 damage suit brought for personal injuries by William Adair of North Platte, Neb., against an automobile manufacturer is won by the plaintiff, many similar suits against automobile manufacturers the country over are likely to follow. The outcome of the suit, which was brought in the district court of Pottawatomie county, Iowa, a few days ago, hinges upon the jury's decision as to the liability of a manufacturer for an accident in which its car is involved

after the car has been sold to a private individual.

The petition sets forth that George Coffee of North Platte, Neb., bought a six-cylinder automobile on May 29, 1914, and that on June 10, 1914, Coffee was taking Adair from North Platte to Cheyenne, Wyo., in this car. One of the wheels broke, and the car turned over upon Adair. He sustained a fractured hip and internal injuries.

The grounds for the suit are that the manufacturing company was negligent in putting a car with defective wheels on the market. The petition sets forth that the spokes were brittle, notwithstanding the fact that the company had advertised that the woodwork was constructed of the best material on the market, and that the car was a perfectly safe vehicle for the transportation of persons on a public highway while running at a speed of 30 to 40 m.p.h.

—

G. M. Davis with Stewart Motor Corp.

DETROIT, March 1—George M. Davis who was manager of the Internal Gear Drive Association which he organized last year, has joined the organization of the Stewart Motor Corp., Buffalo, in the capacity of sales and advertising manager. Mr. Davis is an old timer in the automobile industry, having been advertising manager years ago of the old E. R. Thomas Motor Car Co., also assistant sales manager and advertising manager of the Pierce-Arrow Motor Car Co., both in Buffalo.

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Champion Increases Output to 100,000 Spark Plugs Daily

TOLEDO, OHIO, March 2—The Champion Spark Plug Co., this city, will increase its output from 45,000 to 100,000 spark plugs per day as soon as a new six-story addition to its present quarters is finished. Work will be started on this new building during this month. And to further add to the present production, the company will build another story to its present four-story addition which was built some two years ago. When these additions are completed, it will have 60,000 more square feet of space.

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San Diego Race March 5

SAN DIEGO, CAL., March 2—A 50-mile automobile race is scheduled for March 25 at the Fair Grounds in this city. The race will be under the direction of the Panama-California International Exposition. Entries have already been received from half a dozen drivers. The entrants will compete for a $2,500 cup offered by the Exposition and money prizes. The race will be run over a mile track inside the Exposition grounds.

War Truck Orders Near Finish

—

England Now Fully Supplied —Exports Trucks to Russia —France Fully Equipped

LONDON, ENGLAND, Feb. 18—There is every reason to believe that England now possesses such a supply of automobile trucks that no more orders will be placed in America. Absolute confirmation of this is unobtainable, for only the military authorities are in possession of the full facts, and they refuse to make any statement or to give any indication as to conditions. It is no secret, however, that there is a slackening off in the production of ordinary trucks for military purposes, and that deliveries can be made, under certain restrictions to private concerns. More frequently, however, when the English factories are told to diminish their output of army trucks they are given other military work, instead of being allowed to meet private orders.

A very significant fact, which tends to confirm the statement of England's sufficiency in the matter of trucks, is the recent sale of a number of American trucks to Russia. This sale comprises 500 trucks of the make which has given the greatest satisfaction, originally bought for service in the British army, but since transferred to Russia.

A similar tendency is observable in France, where there appears to be a sufficiency of trucks for all immediate requirements, even supposing, as is quite probable, that hard fighting with frequent movements takes place during the next few months. For some time past only spares have been coming in for the five best known American trucks used by the French, and although Velie has recently received a big order, there is every indication that France has now got as many supplies from America as she needs for some time to come.

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Roto Light Delivery Truck at $695

HANNIBAL, MO., March 7—The Roto Motor Co. has been incorporated here with a capital stock of $350,000 for the manufacture of light delivery trucks. The new company was organized by N. L. Le Blond, manager of the Hannibal Wagon Co., and he expects to start the manufacture of a ½-ton model within the next sixty days.

The Hannibal Wagon Co. will pass out of existence and its plant at Collier and South Eleventh Streets will be turned over to the new concern. L. E. Jerome of Chicago is heavily interested in the Roto company and will reside here. The president will be T. A. Legris of Kankakee, Ill., a member of the Legris Brothers' Banking Co. of that city, and J. E. McNally of this city will be the vice-president.

The plans are to build at least 1500 trucks the first year. It will have a wheelbase of 112 in., with a 31 by 4 tire, a 3½-in. bore overhead-valve engine of the factory's own design and will be sold for $695, equipped with electric starting and lighting system. The car will be assembled at the plant here. A trailer also will be placed on the market.

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Automobiles and Trucks To Star in Military Tournament

NEW YORK CITY, March 7—Automobiles, motor trucks and armored cars will play an important part in the military and naval tournament scheduled to be held at Sheepshead Bay during the week beginning May 20 and ending May 27.

Prizes will be offered to both manufacturers and drivers of armored cars and motor trucks of various sizes and types in endurance trials and field tests. There will be 5000 militiamen camped at the speedway and their transportation and commissary arrangements will require a wide use of both passenger cars and motor trucks of all sorts. Moreover, there are to be parades, searchlight drills, night signalling, etc., all of which will bring the motor vehicle opportunity to prove its value for military purposes.

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Over 100% Rebates to Exhibitors at National Shows

NEW YORK CITY, March 6—At the regular quarterly meeting of the members of the National Automobile Chamber of Commerce, Inc., held yesterday, the show committee reported that 120 per cent will be returned to the exhibitors at New York and 102 per cent to those taking space at Chicago. This excellent showing is entirely due to increased attendance, the public paying approximately 30 per cent more than last year for admission to the shows.

The traffic department report showed that carload shipments of automobiles during February were larger than on any month in the history of the industry.

The freight car shortage is causing considerable inconvenience to the manufacturers, while the increasing difficulty of obtaining cars has been responsible for numerous delays in delivery. Many manufacturers have been obliged to utilize flat cars, while it is becoming frequent for cars to be shipped with fenders removed, so that the narrow-door box cars can be used.

About seventy-five manufacturers were represented at the meeting. T. C. Leland, vice-president of the chamber, presided, as Col. Chas. Clifton is still in Florida.

Chevrolet Earns $1,653,686

Cash on Hand $5,377,079—Predict $6,000,000 Profits for 1916—Materials Scarce

NEW YORK CITY, March 7.—Earnings of $1,128,590 are reported by the Chevrolet Motor Co., for the 4½ months ended December 31, 1915, after deducting expenses. To this total was added $525,096 from other sources, making the aggregate revenue $1,653,686.

Cash on hand on Dec. 31 amounted to $4,192,968 and the statement issued yesterday showed that this has been increased to $5,377,079 by March 3, a gain of nearly 28 per cent in slightly more than 2 months.

W. C. Durant, president of the company, in his statement to the stockholders said: "While materials at the moment are difficult to obtain and prices are considerably higher in some instances the reduction in overhead expenses due to increased volume of product enables us to show a reduction in cost as compared to the 4½ months covered by the report.

"Due to abnormal conditions, as a matter of protection, we are carrying extremely large inventories, fortifying ourselves, to take care of contracts and orders representing a value in excess of $26,000,000 now upon our books for delivery within the next 5 months. The operating profits of the Chevrolet companies for the year ended Dec. 31, 1916, should approximate $6,000,000, to which will be added the income from other sources."

Detailed figures of the income account follow:

Net earnings from operations, after deducting cost of manufacture and expenses of advertising, selling, administration, taxes, etc.		$1,128,590
Other income:		
Cash discounts on goods purchased	$64,129	
Interest earned	24,434	
Dividends received	2,742	
Profit-sale of securities	448,323	
Miscellaneous revenue	15,857	
	$555,488	
Deduct:		
Expenses incidental to organization	30,392	
		525,096
Net income for period (4½ months)		$1,653,686

The Chevrolet company produced in the 4½-month period just 11,888 cars through its five plants in New York City, Tarrytown and Flint. The Oshawa, Ont., and St. Louis plants, which were recently started, have turned out comparatively few cars, their output not being included in the above figures. In February, President W. C. Durant announced that within the next six months the daily output of the company was to be doubled, at the rate of 230 cars a day and stepped up monthly until the plants are producing 460 daily in August.

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C. M. Hall Lamp Co. Doubles Floor Space

DETROIT, MICH., March 6—Additions were completed recently to the plant of the C. M. Hall Lamp Co., which provide about 15,000 sq. ft. of additional floor space for manufacturing purpose. The company has also increased its capital stock from $150,000 to $300,000 a few days ago. At present about 230 men are on the pay roll. They work 14 hours a day during four days. Wednesday and Saturday no overtime is scheduled.

During January and February the increase in business was between 65 and 70 per cent, as compared with the first two months of 1915. Orders now on hand are sufficient to keep the plant in full operation till 1917. This may also be said about the needed materials on hand, which is even sufficient for a large per centage of the 1917 output. The company has large contract orders with the Packard, Hudson, Studebaker, and other automobile manufacturing concerns. Their value is in excess of $1,000,000 of gross business.

The capital stock of the company has been placed on a 2½ per cent monthly dividend basis. Previous to the increase of the capital, the stock had been for some time on a 30 per cent yearly basis.

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United Garage Assn. Appoints Officers

ALBANY, N. Y., March 2—William M. Haradon, New York, was re-elected president of the United Garage Associations of New York, Inc., at the annual meeting and convention held here yesterday and to-day. All other officers also were re-elected, these including vice-president John Van Benschoten, Poughkeepsie and treasurer Edward W. Leahy, Albany. George F. Kaiser was appointed secretary for a term of three years. Among other things, the meeting adopted resolutions deprecating the action of the gasoline refiners in permitting a chaotic condition with regard to prices; approved the passage of a lien law similar to that now in force in New Jersey; approved the introduction and passage of a Fraud on Garage Keepers measure; changed the date of the annual meeting from the first Wednesday in March to the first Wednesday in January, during the New York show; changed the place of the annual meeting from Albany to New York City; revised the By-Laws. The meeting made plain that the association soon will take an active interest and a prominent place in the affairs of the retail trade in New York State. Secretary Robert A. Wilson of the National Automobile Trade Association was present and explained the scope and objects of that body.

Tractors Worth $300,000 Shipped to Russia

Baldwin Locomotive Works Sends Special Train Across Continent to Seattle

YORK, PA., March 3—One of the largest shipments of motor tractors to Russia, on the large contract being filled by the Morton Truck and Tractor Company of Harrisburg, was sent this week to Seattle, Wash., for export shipment. The total value of the shipment is $300,000. A solid train of sixty cars, each car loaded with a truck, was used for transporting the large war order.

The tractors were built at the plant of the Baldwin Locomotive Works, Philadelphia, on a sub-contract, and two weeks ago were shipped from the Quaker City to New York. Owing to the freight blockade at the New York terminal the cars were tied up in freight yards in the metropolis. Upon receipt of notice to rush the shipment as rapidly as possible and in view of the fact that railroad officials are unable to say how soon the blockade in the East will be lifted, the Harrisburg company believed that considerable time could be saved in shipping West, notwithstanding that the route to Russia *via* Seattle is 5000 miles further.

The Pennsylvania railroad handled the special train as preference freight with instructions to permit no delays at division terminals. Each truck is packed in a large box which takes up all the room on a gondola, 60 ft. long. Assurance was given by the railroad company officials that a boat would be ready at Seattle to take the shipment.

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Chicago's Amateur Speedway Race May 20

CHICAGO, ILL., March 8—Entry blanks have been sent out by the Speedway Park Assn., this city, for the Western Interclub, non-professional automobile race at Speedway Park, on May 20. The race is for Class E, non-stock cars with a special invitation for fully equipped roadsters. The event is under the auspices of the Chicago Automobile Club and other leading clubs of the West.

The Western Interclub Cup has been offered and will become the permanent property of the driver winning the event three times. A gold brassard will be given the winner of each heat held on the speedway.

The contest will consist of four heats, three preliminary heats, and one final. The preliminary heats will be 20 miles or ten laps of the course, and the final will be 30 miles or fifteen laps of the course.

Maibohm Roadster Announced

New Car Is Product of Maibohm Motors, Racine—Four Cylinder Model $595

RACINE, WIS., March 6—The Maibohm roadster has been introduced and is to sell at $595. This car is of the light car type with low-hung and distinctive lines. This car is the product of the Maibohm Motors Co., Racine, Wis., recently formed and headed by H. C. Maibohm, formerly connected with the Locomobile Co. of America and until recently president of the Motor Supplies Co. Associated with him are P. C. Maibohm, former president of the Maibohm Wagon Co., and J. R. Foster, former president of the Foster-Lockwood Oil Co.

Temporary manufacturing facilities have been secured in Racine and negotiations are now pending for a permanent factory site. The company will produce 2000 cars during the first year, two-thirds of which are said to be already sold to dealers. Particular attention has been paid to the comfort of passengers, the seats being unusually low and on an almost direct horizontal line with the pedals which are adjustable to any desired leg room. The steering post is also adjustable to the requirements of the operator.

Four Cylinder 3 by 5

The four-cylinder, valve in head motor is provided with three-point suspension and is rated at 14.4 hp., having 3 by 5-in. cylinders. It has a detachable cylinder head.

Lubrication is by constant level splash under the connecting-rods and pump to the three main bearings. Cooling is thermo-syphon with extra large inlet and outlet manifolds cast integrally with cylinder block. Ignition is Atwater-Kent with automatic spark advance, current being supplied by a 6-volt 100-hr. battery located under the seat in a steel hanger. Starting and lighting is by an inclosed silent chain drive single-unit system which is attached to front gear case. Fuel is gravity supplied by a 10-gal. gasoline tank located in the dash cowl.

The frame is a pressed steel channel section 3 by ⅛-in., curved over the rear axle to permit underslung semi-elliptic rear spring construction. The wheelbase is 105-in. and size of tires is 30 by 3½. Wood or wire wheels are supplied at the option of the purchaser. Throughout the chassis, with exception of motor, Hyatt and Timken bearings are used.

The gearset is compact in form and with the dry-disk clutch is supported to the rear of the motor. Three speeds are used and center control levers are conveniently placed. The Hotchkiss system of propulsion is used and the master leaf of each rear spring has been strengthened by the use of a special heat-treated steel.

Both front and rear springs are of the semi-elliptic type, 2 in. wide and almost flat. The rear unit is built along standard lines with a pressed steel housing that carries the weight of the car and relieves the driveshaft from any duty except propulsion of the car. Equipment features include electric starting and lighting, a flush type speedometer and lock switch, electric horn, rear tire carrier, one-man top, tools, etc.

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Lane Heads Truck Co.

KALAMAZOO, MICH., March 2—M. H. Lane has been elected president and general manager of the recently organized Lane Motor Truck Co. G. E. Bardeen, Jr., is secretary-treasurer. The first model is expected to be out about March 15. It will be of the worm-drive type.

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Speeds Up Gasoline Price Investigation

WASHINGTON, D. C., March 6—At the request of several members of Congress the Federal Trade Commission is preparing to speed up the investigation of the increase in the cost of gasoline. Joseph E. Davies, chairman of the commission, has appointed Lewis E. Haney of Austin, Texas, chief counsel in charge of the investigation. Haney will be aided by a corps of experts, and everything possible will be done to hurry the inquiry.

Report Due Soon

All complaints to the Department of Justice regarding the rise in price of gasoline have been referred to the Federal Trade Commission. It was announced some time ago by Commissioner William J. Harris, who has been in active charge of the inquiry, that about three months would be required to complete a report. This has prompted the California Congressional delegation and other Congressmen to threaten a Congressional investigation if the commission did not give assurances that a report would be made within a few weeks.

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Overland Reaches 100,000 Mark

TOLEDO, OHIO, March 2—The 100,000 mark was reached by the Willys-Overland company last Monday with shipments to date more than treble those reached a year ago. Overland dealers now number nearly 5000 in this country and Canada. Foreign dealers number about 500.

Industry Ranks Fifth in Exports

Well Up in List of Manufactured Articles—Gained 232% in 1915

NEW YORK CITY, March 6.—Automobiles and parts rank fifth in value among all manufactured articles exported from the United States, according to an analysis by the National Automobile Chamber of Commerce of the statistics contained in the December report of the Department of Commerce. The relative value of the leading manufactured articles exported during 1915 is:

Iron and steel	$338,703,720
Explosives	181,778,033
Refined mineral oils	138,689,495
Copper and manufactures	125,136,289
Automobiles and parts	111,180,139
Wheat flour	96,201,234
Cotton and manufactures	95,827,024
Other machinery	81,224,345
Chemicals, drugs, etc	80,395,321
Locomotives, vehicles, etc	78,015,574
Leather and manufactures	75,268,680

In one year the exports of motor vehicles increased more than 232 per cent—from a total value of $28,507,464 in 1914 to $94,879,738 in 1915. The foreign shipments of passenger cars almost doubled—from 22,335 valued at $19,521,708 in 1914 to 41,869 valued at $35,045,492 for the year ended December 31, last. But the exports of trucks increased nearly seven-fold, from 3,430 worth $8,985,756 to 22,082 valued at $59,834,246.

Truck Increase Large

Growth of the foreign trade in American motor trucks during the last two years is even more noteworthy, for in 1913 only 1,009 commercial vehicles were exported, of a gross value of $1,686,807, the increase in two years being 3447 per cent.

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Hudson Adds 641,600 Sq. Ft. in Five Years

DETROIT, MICH., March 3—In five years, from 1910 to the end of 1915, the Hudson Motor Car Co. has added a total of 641,600 sq. ft. of floor space to its plant. In the original building there was a total of 172,282 sq. ft. of floor space. In 1912 new constructions added 72,422 sq. ft.; in 1913 there was an increase of 82,744 sq. ft. of floor space. The following year 53,370 sq. ft. were added and in 1914 the additions totaled 104,574 sq. ft. It was, however, last year when the biggest new area was added to the plant, the new buildings put up and the additions of floors to other buildings providing a total of 328,490 sq. ft. of new constructions, or more than half the total put up since 1910. The total area now occupied by the Hudson plant contains 813,882 sq. ft. of floor space.

Kerosene as Fuel for Automobiles

Colorado State Inspector Starts Campaign for Educating Automobile Users

DENVER, COL., March 4—A campaign to meet the condition of high-priced gasoline by substituting kerosene for use in combustion engines has been started by Colorado State Oil Inspector James Duce, assisted by Prof. John A. Hunter, professor of mechanical engineering in the University of Colorado. After extensive experiments, their first public step toward educating motor car owners and other users of gasoline engines was made yesterday in the way of a meeting at the State house for a general discussion of the fuel problem and the technical points involved in using kerosene. The meeting was attended by representatives of the Automobile Trades Association of Colorado and the Denver Motor Club, by tractor, and oil men and a goodly number of individual motor car and tractor users.

Kerosene Gives More Power

It was shown that tractor motors built originally for kerosene usage develop as much power from a gallon of kerosene costing 12 cents as can be produced by a gasoline tractor from a gallon of gasoline costing 23 cents, while slight mechanical changes will enable a regular gasoline motor for motor cars to develop equal power from about one-fourth more kerosene than gasoline, making the cost ratio for practically the same power in motor cars 16 cents for kerosene as against the present Denver price of 23 cents for gasoline. It was urged that the added difficulty of handling kerosene motors could easily be overcome by careful study of required methods of handling, aided by rapidly advancing engineering improvements, and that the question of more unpleasant odor from kerosene could be largely disposed of by practical education against established prejudice along this line.

Inspector Duce's records show that Colorado consumed about 15,000,000 gal. of gasoline during 1915, a gain of 45 per cent over the previous year. He argues that the most practical way to check the alarming advance in the price of gasoline is to substitute kerosene, which has become a by-product of the oil refineries, particularly those operated by independent concerns.

The present gasoline price of 23 cents, which is the highest on record for Denver in fifteen years or more, has been reached by a rapid series of one-cent jumps during the last ten months from 12 cents, which was the lowest price ever recorded here in twenty years.

Professor Hunter and other engineers at the State university at Boulder, where gasoline is now 28 cents, are experimenting along all lines of mechanical developments required to insure the success of using kerosene as a motor fuel, and declare themselves ready to furnish practical information and suggestions to all inquirers as an aid to Inspector Duce's Statewide campaign for kerosene tractoring and motoring.

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Fisk Shows Good Profit Increase

CHICOPEE FALLS, MASS., March 4—The annual report of the Fisk Rubber Co. for the year ended Dec. 31, 1915, shows net profits of $1,791,579 as compared with $942,204 in 1914. The report states that, in accordance with the first preferred stock provision, there were retired Dec. 31, 1915, out of profits of the company 3750 shares of the first preferred stock, which, with the first preferred stock previously retired, represent the par value of $600,000.

The company reports the following income statement for the year ended Dec. 31, 1915:

	1915	1914
Net profits	$1,791,579	$942,204
Reserve for inventories	145,160	160,000
Balance for dividends	$1,646,579	$782,204
First preferred dividend	219,042	210,000
Second preferred dividend	140,000	140,000
Total dividends	$359,042	$350,000
Surplus	$1,287,537	$432,204
Previous surplus	619,267	187,063
Total surplus	$1,906,804	$619,267
Deductions	660,410	.....
	$1,246,394	$619,267

The balance sheet as of Dec. 31, last, follows:

Assets

	1915	1914
Capital assets	$12,428,564	$12,461,364
Inventories	4,531,377	2,622,721
Tires in use	40,066	49,899
Due on notes	128,955	175,482
Notes and accounts receivable	1,330,208	2,131,577
Cash	991,909	362,644
Deferred charges	127,273	84,609
Total assets	$19,578,352	$15,888,296

Liabilities

Capital stock	$14,775,000	$13,000,000
Notes payable	2,200,000	1,745,000
Accounts payable	577,650	228,525
Dividend not paid	807	37
Reserve for contingencies	178,502	207,967
Surplus appropriation for retirement of preferred stock	600,000	.....
Profit and loss surplus	1,246,394	619,267
Total liabilities	$19,578,352	$15,888,296

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Maise with Springfield Metal Body

DETROIT, MICH., March 4—Herman Maise who was formerly with the Fisher Body Co., here, and with the W. F. Stewart Co., Flint, Mich., both body makers, has recently joined the Springfield Metal Body Co., Springfield, Mass., in the capacity of chief engineer.

Reo Expects General Price Rise

Cost of Materials and Tools Must Affect Selling Price Says R. C. Rueschaw

LANSING, MICH., March 4—The new and higher prices rather than the new models will be the feature of the 1917 announcements of the automobile manufacturers, according to sales manager R. C. Rueschaw of the Reo Motor Car Co.

Mr. Rueschaw has made an investigation of the general conditions prevailing among those concerns which supply raw material, other products and also machinery necessary to the automobile manufacturer. From the data gathered by George E. Smith, who is manager of the purchasing department of the Reo company, it seems, according to Mr. Rueschaw, that there is no other possibility for the motor car manufacturer than to increase his prices for next season. Not only are prices of materials at the present time without a parallel in the history of the automobile industry, but, there is no hope for a betterment of this condition.

Freight Car Is Big Trouble

Aside from the question of prices of materials, Mr. Rueschaw believes that the shortage of railroad freight cars is another reason for prices to be increased, because it will compel some factories to slow down and thus will cause an extension of the date on which the present factory run, that is the 1916 output, is to be completed. This means that instead of completing the schedule by July 1, it will probably be some time during autumn before it is completed. This unanticipated and unremediable course will thus very likely affect the price of the cars of those manufacturers.

"The present market situation was foreseen by us," said Mr. Rueschaw, and we started early to fill our warehouses so that at the present time we have not only practically everything we need up to the close of our fiscal year, but, we are also comfortably covered for most anything we will need for a year beyond that. Such action on our part was and is necessary considering the time required, or rather requested, for delivering goods ordered. For instance, orders for bar steels placed in December, 1915, will not be delivered until January, 1917. Ordinarily cold rolled bars cannot be secured in less than six months. We are able to buy odd lots of bar steel and forging steel in small quantities but at twice or three times the normal price.

"High speed steels have increased in price from 45 cents per pound to $3.

Sizes of Truck Motors and Outline of British Practice

(*Continued from page* 446)

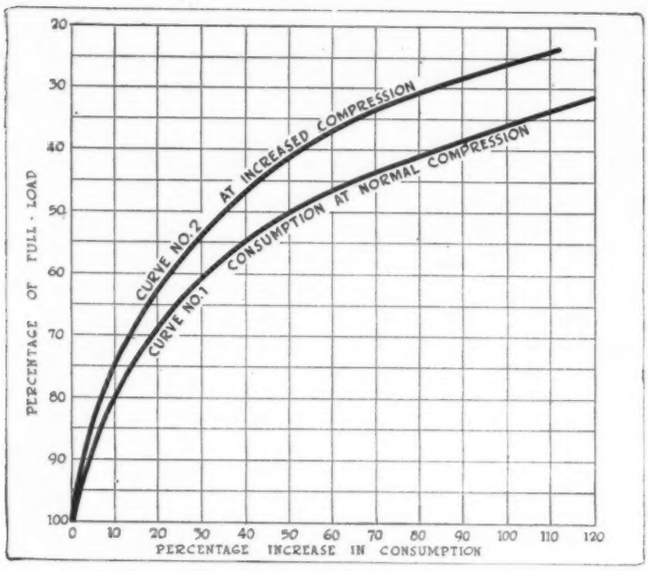
PERCENTAGE OF FULL-LOAD
PERCENTAGE INCREASE IN CONSUMPTION
CURVE NO.2 AT INCREASED COMPRESSION
CURVE NO.1 CONSUMPTION AT NORMAL COMPRESSION

Fig. 4—Chart showing effect—with governed engine—of light loads upon consumption

and the equation becomes:

$$87 \times \frac{1000}{6} \times V = W \times \frac{3995 \times 11.5 \times 1760 \times 3}{30 \times 60}$$

$$\text{or } V = W \times \frac{3995 \times 11.5 \times 1760 \times 3 \times 6}{30 \times 60 \times 1000 \times 87}$$

$V = 9.3\ W$ approximately.

$Q = 9.3$.

The curve showing the relation of torque to road resistance is Curve 2 in Fig. 2, and the gradients the vehicle is capable of climbing on top gear at various speeds are shown in Curve 2, Fig. 3.

Gasoline Consumption

Having found the engine size for the gradient desired, the cost of this climbing power in gasoline consumption should be examined. Taking the original engine with "Q" = 5.5, and assuming the vehicle is on the level with a total resistance of 71.5 lb. per ton and a consumption of 0.58 pints per b.h.p. per hour, then for 0.58 pints

the work done =

$$33{,}000 \times 60 = 1{,}980{,}000 \text{ ft.-lb.},$$

and for 1 gal. the work done =

$$1{,}980{,}000 \times 13.8 = 27{,}324{,}000 \text{ ft.-lb.}$$

One ton of gross weight absorbs, per mile, on the level:

$$71.5 \times 1760 \times 3 = 377{,}000 \text{ ft.-lb.}$$

The consumption would therefore be

$$\frac{27{,}324{,}000}{377{,}000} = 72.5 \text{ ton-miles per gallon.}$$

In the case of the engine with "Q" = 9.3 it is capable of giving out at full load a torque to overcome a road resistance at 15 m.p.h. of 121 lb. per ton, but is only using 71.5 lb. per ton or about 59 per cent.

Reference to Curve 1, Fig. 4, shows that this means an increase in consumption of 33 per cent. The consumption per b.hp. per hour rises to 0.77 pints, and the ton-miles per gallon falls to 54.5. Probably 75 or 80 per cent of the distance traveled is on level, or almost level, roads, and this increase in consumption serves to show the cost of the reserve power considered necessary for hill climbing. As far as current practice is concerned, this would be looked upon as quite a reasonable result.

Curve 2 on Fig. 4 shows the improvement that can be obtained at decreased loads by increased compression. This curve was taken from the same engine as Curve 1. The increased compression made the engine very prone to knock at low speeds with full throttle opening. This knocking commenced at about 700 r.p.m., or, in other words, at about the speed at which a change of gear should be made to keep the engine within its range of minimum consumption.

Average Loads Versus Full Loads

It would appear than engine builders do not give sufficient attention to the fact that the normal condition of working is at about 60 per cent of full load.

Consumption curves are usually taken under full load, and the carbureter adjusted to give the best result under these conditions. Probably better consumption on the road would be obtained if the carbureter were set to meet these conditions of light load at which the engine is running for the greater portion of its time. Even though this lead to slightly decreased maximum torque and a slightly increased consumption at full load, the net result would be a decided gain.

Engine Sizes for Various Vehicles

Taking "Q" = 9.3 for 1300 r.p.m. and 15 m.p.h., Table A gives the engine sizes for various vehicles.

Table A (Q = 9.3)

Gross Weight of Vehicle	Cylinder capacity, cubic inches	Bore and stroke of engines, in inches, with approximately 1.3 ratio
4½ tons	41.85	3½ × 4½
5 "	46.5	3⅝ × 4¾
6 "	55.8	3 13/16 × 5
7 "	65.1	4 × 5¼
8 "	74.4	4 3/16 × 5½
*9 "	56.25	3 13/16 × 5
*10 "	62.5	3 15/16 × 5¼

*Twelve miles per hour.

Note.—For 9 and 10 tons gross weight the table is corrected for road speed and resistance, and "Q" therefore becomes 6.25 for these cases.

Current Practice in Engine Sizes

An examination of the engines in a number of successful types of commercial vehicles shows that the average ratio of engine speed to road speed is 1000 r.p.m. for 15 m.p.h., and that "Q" has a value of 12.5.

This agrees quite well with the 9.4 obtained for 1300 r.p.m. if the necessary correction be made for engine speed, as we have

$$\frac{12.5 \times 1000}{1300} = 9.64.$$

Stroke Bore Ratio

There does not appear to be any tendency to fix a definite ratio of stroke to bore. Examination of a large number of

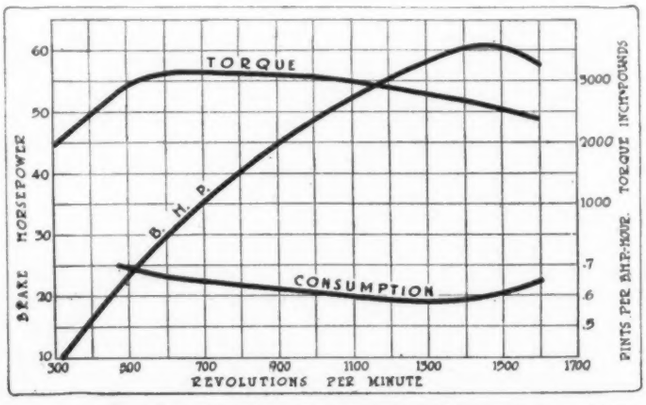

Fig. 5—Curves showing torque and consumption curves as taken from Tyler motor

motors showed an average of 1.3, but this figure would appear to be of little value since no maker appears to have two motors of different sizes with the same ratio. Curiously enough more than 50 per cent of the engines examined had strokes of 5½ in., and the tendency appears to be to have a range of engines to suit the various sizes of vehicles all having the same stroke. No doubt this arrangement materially decreases the number of jigs and allows for interchangeability of a number of parts, so cutting down cost of production.

Taking "Q" at 12.5, and allowing 15 miles an hour at 1000 r.p.m. for vehicles up to and including four-tonners, and 12 m.p.h., with the necessary correction, for five and six-tonners, Tables B and C give the engine sizes.

Table B (Q = 12.5)

Gross weight of vehicle	Cylinder capacity, cubic in.	Engine size suggested, inches	Engine size with 1-3 ratio, inches	Engine size with constant stroke (5½ in.)
4½ tons	56.25	4 × 4½	3 13/16 × 5	3⅝ × 5½
5 "	62.5	4¼ × 4½	3 15/16 × 5⅛	3 13/16 × 5½
6 "	75.	4¼ × 5½	4 3/16 × 5½	4 3/16 × 5½
7 "	87.5	4½ × 5½	4 7/16 × 5¾	4½ × 5½
8 "	100.	4¾ × 5¾	4⅝ × 6	4 13/16 × 5½
*9 "	75.	4¼ × 5½	4 3/16 × 5½	4 3/16 × 5½
*10 "	83.3	4½ × 5½	4⅜ × 5⅝	4 7/16 × 5½

*Twelve miles per hour.

The following table relates to the approximate weights of actual vehicles, and is based on the same lines as Table B.

Table C (Q = 12.5)

Useful load	Gross weight	Cylinder capacity, cubic in.	Engine size 1.3 ratio	Engine size with 5½ in stroke
2 tons	5 tons	62.5	3 15/16 × 5⅛	3 13/16 × 5½
2½ "	5.672 "	71.	4⅛ × 5⅜	4 1/16 × 5½
3 "	6.56 "	81.25	4 5/16 × 5⅝	4⅜ × 5½
3½ "	7.56 "	93.75	4½ × 5⅞	4¾ × 5½
4 "	8.28 "	103.125	4 11/16 × 6	4⅞ × 5½
5 "	10. "	83.3	4⅜ × 5⅝	4 7/16 × 5½
6 "	11.25 "	93.75	4½ × 5⅞	4¾ × 5½

By grouping, three sizes of motors can be used for the seven vehicles in Table C, any small discrepancy being easily regulated by adjustments in gear ratio; the arrangement might be as follows:

Table D

Engine size:	4 in. × 5½ in.	4⅜ in. × 5½ in.	4¾ in. × 5½ in.
Useful load of vehicle:	2 and 2½-ton vehicles	3-ton and 5-ton* vehicles	Subsidy type 4 and 6-ton

*Twelve miles per hour.

Heavy Passenger Vehicles

For motor char-a-bancs, which are expected to have greater climbing ability on top gear, the gradient may be taken as 1 in 24, to be climbed at 12 m.p.h., with the engine running at 800 r.p.m.

$$\text{Then } 87 \times \text{Volume} \frac{800}{6} = W\left(60 + \frac{2240}{24}\right) \times 12 \times 88,$$

$$\text{or } 87 \times \text{Volume} \times \frac{800}{6} = \frac{1440\ W + 2240\ W}{24} \times 12 \times 88,$$

$$= \frac{3680}{24} W \times 12 \times 88,$$

$$\text{and Volume} = W \frac{3680}{24} \times \frac{12 \times 88 \times 6}{800 \times 87} = W \frac{6072}{435}$$

$$\text{Or Volume} = 14\ W \text{ approximately.}$$

Taking as an example a 30-seated vehicle weighing, when loaded, 6 tons, we get:

Gross weight.	Cylinder volume	Cylinder size.
6 tons.....	84 cu. in.....	4 7/16 in. × 5½ in.

In the last named case one of the three standard sizes suggested might be used, namely, 4⅜ in. by 5½ in. with suitable gear correction.

The curve in Fig. 6 shows current American practice, and is based on the average of 160 vehicles.

Part 2—Outline of British Truck Motor Design

Design features in British commercial vehicles which are more or less affected by the nature of the vehicle service, are referred to in the following:

Compression Pressure

An examination of a number of engines shows the average ratio of total volume to swept volume to be 4.4, and if the compression is calculated on $PV^{1.3} = \text{Constant}$, with 13 lb. initial pressure, this shows a gage pressure on compression of about 75 lb., and an explosive pressure which, under ordinary conditions of cylinder shape and cooling, might be taken at 280 lb. per square inch.

Connecting-Rod Bearings

Coming to the bearing surface usually allowed for the big end of the connecting-rod, the practice of manufacturers shows an average of 765 lb. per square inch on the projected area. The highest pressure observed is about 950 and the lowest about 620 lb. per square inch. Neglecting the pressure and taking into account only the respective areas of cylinder and bearing, an average of 1 sq. in. of big end area for 2.73 sq. in. of piston area is obtained. In the limits of the engines under consideration, say from 3½ in. bore to 5 in. bore, the average diameter of the crankpin in use corresponds very closely with 0.4 bore + ¼ in.

Gudgeon pin pressure may be taken at 2100 lb. per square inch,

or the area of the pin is given by $\frac{D^2}{9.6}$ in square inches, D being the diameter of the cylinder.

Gudgeon pin diameters show a close approximation to big end diameter — 1 1/32 in. for the sizes of engines under consideration.

In commercial vehicle engine design, the three-bearing crankshaft is usually used, and there would appear to be no particular reason for fitting five bearings. At the same time there are two or three very successful engines having five-bearing crankshafts, and one at least with only two main bearings.

(To Be Continued)

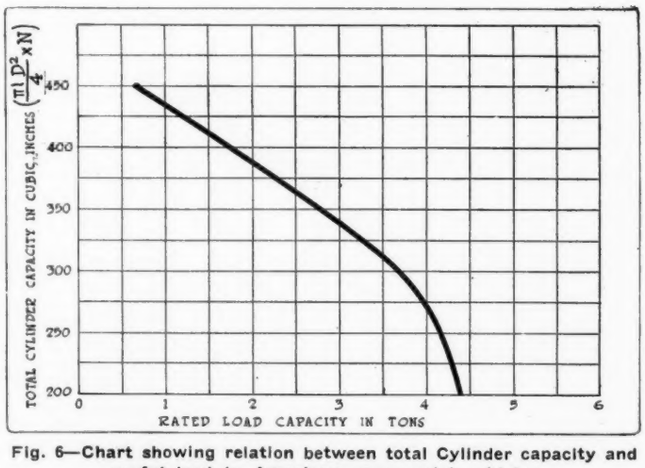

Fig. 6—Chart showing relation between total Cylinder capacity and useful load in American commercial vehicles

South's Profits $10,000,000,000—Sales Gain

(*Continued from page* 462)

of July that year. The avenues of trade shrank until they became mere alleys and in some cases ceased to exist. Then followed another twelvemonth in which business grew somewhat, and while the latter half of 1915 was far better for lumbermen than they had anticipated, the gain was not sufficient to put production back on the basis from which it was routed at the beginning of hostilities abroad. In support of this statement, note the table given herewith, showing the production of lumber in board feet in 1914 and 1915 from the several States south of the Ohio River and east of the Mississippi:

Production of Lumber—Board Feet

State	1915	1914
Arkansas	992,292,000	1,022,874,000
Texas	1,226,129,000	1,231,166,000
Louisiana	2,999,430,000	3,102,055,000
Mississippi ...	1,196,444,000	1,279,181,000
Alabama	596,550,000	662,638,000
Georgia	235,554,000	275,190,000
Florida	646,892,000	620,769,000
South Carolina	370,180,000	311,960,000
North Carolina	625,492,000	628,340,000
Virginia	259,772,000	231,800,000
West Virginia.	530,119,000	572,320,000
Kentucky	100,479,000	112,819,000
Tennessee	159,868,000	211,496,000
Total	9,939,201,000	10,262,608,000

Business done so far in 1916 is far ahead of that of the preceding year, and it appears that the predictions of the lumbermen of the South are to be realized. The South has bought many cars in the last year, and with a healthy tone of optimism to the so-called barometer of trade, it augers very well for the sale of cars during 1916.

$100,000,000 for Lumber

Granting that $10 per 1000 ft. is an average price of lumber at the mills, the foregoing figures show that approximately $100,000,000 came into these States during both of these years. Perhaps $10 a thousand is too low a figure; we know it is if we are to take the price we have to pay for it out of the city and country yards where lumber is not produced. It costs us about twice or three times that amount.

Lumber and lumber products should bring into the coffers of the South from $100,000,000 to $200,000,000 during 1916. The percentage of this that is turned over to automobile dealers will be governed very much by their aggressiveness. The lumber branch of revenue production is but one factor that contributes to the prosperity of the South, so it seems a safe wager that this year will see more cars sold south of the Ohio than in any preceding year, especially with the good roads agitation and the touring sections being exploited now as never before.

Railroads are buying timber for making cars, and much of this material comes from the South. Long-leaf yellow pine is specified in a great many cases and the railroads are preparing for a new era of prosperity in general. When the railroads begin to add to their equipment, especially the complement of freight cars, it means that they are practically sure that there will be need for them. Every railroad leading into Chicago has contracted with car makers or for material for the construction of additions to its rolling stock, especially freight cars. This will redound to the benefit of the South in two ways—it will create a good demand for material, good demand stimulating prices, and it will bring additional money to the South with which to purchase the necessities and the luxuries.

Iron and Steel Industry in South

THE South makes important contributions to the great iron and steel industry, especially Alabama, Georgia, Kentucky and Tennessee, Louisiana and Texas also deserving some mention in this particular. There are seventy-six blast furnaces in the six States, of which forty-nine were in operation a year ago, their combined output of pig iron being 2,280,070 tons, as compared with a capacity of 4,885,400 tons for the year. There are fifteen steel works, of which twelve were active a year ago, their total output for the year showing 737,037 tons of steel ingots and castings, the total annual capacity being 1,443,225 tons. Of twenty rolling mills, seventeen were working a year ago, their production for the previous year totaling 626,305 tons of rolled iron and steel products for the six States. The 5,328,911 tons of iron ore produced in this district during the same year, combined with the 44,809,714 tons of coal and 3,816,752 tons of coke, serve to give an idea of the magnitude of these industries in this region.

Alabama Leads in Steel

As shown in the accompanying tabulation, Alabama is the leader, having forty-eight blast furnaces, of which thirty were in operation a year ago, producing 1,826,929 tons of a capacity of 3,660,000 tons of pig iron during the year. Out of

Statistics of the Iron and Steel Industry in Six Southern States at the end of 1914*

State	Number Blast Furnaces	Number Active Furnaces	(Pig Iron) Capacity of Furnaces, Tons	Tons Pig Iron 1914 Output	Number Steel Works	Number Active Works	Capacity of Works, Tons	Steel Ingots and Castings, Output, Tons	Rolling Mills	Active Mills	1914 Tons Output Rolled Products	Production Iron Ore, Tons	1914 Prod. Coal, Tons	1914 Prod. Coke, Tons
Alabama.....	48	30	3,660,000	1,826,929	5	3	995,000		9	7	413,654	4,838,959	15,993,422	3,084,149
Georgia.....	4	0	129,500	0	1	1	60,000	572,073	2	2	61,229 including Tenn. and Texas	67,772	166,498 including N. C.	24,517
Kentucky....	6	5	314,250	236,393	2	2	380,000	164,009 including Tennessee	7	6	151,422 including N. C.	91,966 including W. Va., Md. and N. C.	20,382,763	443,959
Louisiana....	0	0	0	0	2	2	1,850	955 including Texas	0	0	0	0	0	0
Tennessee....	18	14	781,650	216,738	3	2	6,000	See Kentucky	1	1	See Georgia	330,214	5,943,258	264,127
Texas.....	0	0	0	0	2	2	375	See Louisiana	1	1	See Georgia	0	2,323,773	0
Total.....	76	49	4,885,400	2,280,070	15	12	1,443,225	737,037	20	17	626,305	5,328,911	44,809,714	3,816,752

*From the Annual Statistical Report of the American Iron and Steel Institute.

five steel works in the State, three were active last year, producing, in conjunction with the one in Georgia, 572,073 tons of steel ingots and castings, out of a capacity of 1,055,000 tons. With seven out of nine rolling mills active, Alabama produced 413,654 tons of rolled iron and steel. It is significant that of the total of 5,328,911 tons of iron ore produced during the year, this State was responsible for 4,838,959, while its coal production was 15,993,422 tons and its output of coke, 3,084,149.

Kentucky and Tennessee are well represented in the production statistics of the iron and steel industry. Kentucky has six blast furnaces, five being in operation a year ago, producing 236,393 tons of pig, as compared with a total annual capacity of 314,250 tons. Two steel works in each of the two States show an output of 164,009 tons of steel ingots and castings, their total capacity being 380,000 tons. Six of the seven rolling mills in Kentucky were active a year ago, their output, combined with that of North Carolina's mills, totaling 151,422 tons. The coal industry of Kentucky is larger than in any of the other five States mentioned, producing 20,382,763 tons annually, the output of all six being 44,809,714. The iron ore production of Kentucky, combined with that of West Virginia, Maryland and North Carolina, was 91,966 tons during 1914, while the coke output for Kentucky alone was 443,959 tons.

Tennessee had fourteen of eighteen blast furnaces working at the beginning of 1915, the production for the previous twelve months being 216,738 tons of pig, compared with an annual capacity of 781,650 tons. Tennessee's production of iron ore for the year was 330,214 tons, while 264,127 tons of coke and the 5,943,258 tons of coal give an inkling of the magnitude of other branches of the iron and steel trade in this State.

Georgia a Steel Producer

Georgia has four blast furnaces with an annual capacity of 129,500 tons of pig iron, although none were in operation at the end of 1914. Its steel works, however, produced a good share of the total of 572,073 tons of steel ingots and castings given for Alabama and Georgia. Its capacity is 60,000 tons a year. Georgia's two rolling mills, combined with one each in Tennessee and Texas, produce 61,229 tons of rolled iron and steel for the year. Iron ore to the extent of 67,772 tons, with 24,517 tons of coke and the 166,498 tons of coal mined in Georgia and North Carolina were other products for 1914.

Louisiana and Texas do not contribute quite as largely as the other States mentioned to the iron and steel industry of the country, but their steel works, rolling mills and the 2,323,773 tons of coal produced by Texas are worthy of attention. These States have two steel works each, their combined capacity being 2225 tons of steel ingots and castings, of which 955 tons were produced in 1914. Texas also has one rolling mill, its output being included in the 61,229 tons of rolled products credited to the three States, Georgia, Tennessee and Texas.

Car Registrations Gain Steadily

THOUGH the increase in car registration in the States of Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi and Tennessee has not been phenomenal, it has been steady and fairly consistent. It is only recently that several of the group have kept records of their automobile and motor truck registration, so that some of the statistics for previous years are necessarily estimates.

At the end of 1915 there were 120,126 cars and trucks in use in the States mentioned, this being a gain of 40,727, or 51 per cent over the 1914 total of 79,399. It must be pointed out that this apparent increase is somewhat misleading as the 1914 statistics for Louisiana and Mississippi were estimates made in the absence of official records and proved to be very low as compared with the 1915 figures. Probably the actual gain is nearer the average increase for the entire country, which is 39.6 per cent, including all the States.

Many People Per Car

Something that cannot be misinterpreted, however, is the striking difference between the population-to-car ratio of the entire country, 42 to 1, and that of the seven States mentioned, 120 to 1. Of course, this is largely due to the preponderance of the impecunious negro element in the population of these States, but even allowing for this, there would seem to be a considerable margin of persons able to buy cars.

Tennessee and Georgia are the leaders of the group in total registration, Tennessee having 27,266 cars and trucks, or one to every eighty-four of its population, and Georgia 24,059, one to each 117 of its inhabitants. Tennessee's increase over 1914, however, was 7598 cars and trucks, or 39 per cent, as compared with only 3259, or 16 per cent, for Georgia. During the five years since 1911, Tennessee added 20,802 cars to its lists with only 11,819 credited to Georgia.

Kentucky's Gain Largest

Kentucky ranks third of the seven States, having 19,500 automobiles and trucks in use at the end of 1915, a gain of 7754, or the largest of the group. The 66-per cent gain seems small as compared with the 195- and 215-per cent gains apparently made by Louisiana and Mississippi, but it must be remembered that these are probably far in excess of the actual increase in registration in these States, as the only statistics available up to 1915 were estimates, which

1915 INCREASE IN REGISTRATIONS IN SEVEN STATES

State	Registration in 1914	Registration in 1915	Car Increase	Per Cent Increase
Alabama	8,425	13,798	5,373	64
Florida	11,366	13,123	1,757	15
Georgia	20,800	24,059	3,259	16
Kentucky	11,746	19,500	7,754	66
Louisiana*	3,500	10,880	7,380	210
Mississippi*	3,894	11,500	7,606	195
Tennessee	19,668	27,266	7,598	39
Total	79,399	120,123	40,727	....
Average per cent increase.	....	....	....	51
Average for U.S.	....	....	....	39.6

*1914 registration statistics in Louisiana and Mississippi were estimates made in the absence of official records and proved to be low as compared with the 1915 figures so that the apparent gain is in excess of the actual increase.

POPULATION AND CAR REGISTRATION

State	Pop. to Jan. 1, 1916	Cars Reg.	Pop. per Car
Alabama	2,316,943	13,798	168
Florida	882,148	13,123	67
Georgia	2,836,177	24,059	117
Kentucky	2,372,412	19,500	121
Louisiana	1,815,218	10,880	167
Mississippi	1,939,226	11,500	168
Tennessee	2,279,691	27,266	84
Total	14,441,815	120,126	....
Average population per car	.....	....	120

Average population per car for the entire United States is 42.

CAR AND TRUCK REGISTRATIONS BY YEARS SINCE 1911

State	1911	1912	1913	1914	1915	Increase in 5-Year Period
Alabama	2,856	3,385	5,435	8,425	13,798	10,942
Florida	3,889	6,749	8,372	11,366	13,123	9,234
Georgia*	12,240	19,120	18,500	20,800	24,059	11,819
Kentucky	2,868	5,147	7,210	11,746	19,500	16,632
Louisiana*	4,867	7,000	7,200	3,500	10,880	6,013
Mississippi	1,240	2,895	3,000	3,894	11,500	10,260
Tennessee	6,464	9,973	14,103	19,668	27,266	20,802
Total	34,424	54,269	63,820	79,399	120,126	85,702

*Louisiana's report for 1914 was not complete owing to a new law going into effect about the time the census was made. The same applies to Georgia's statistics for 1912.

were purposely made conservative. Kentucky's population-to-car ratio, however, is not so creditable, being 121 to 1. Since 1911, Kentucky has added 16,632 cars and trucks.

Alabama, which ranks fourth, shows nearly as high a percentage increase in registration as Kentucky, having gained 5373 motor vehicles, or 64 per cent during 1915, giving a total of 13,798, with an increase of 10,942 since 1911. In respect to population-to-car ratio, Alabama ranks with Louisiana and Mississippi, being third from the bottom of the list of the entire United States, having 168 people per car, so it would seem that there is still ample opportunity for a considerable increase in the number of cars sold in the State.

Florida's Population Ratio Best

Florida is fifth of the group, its registration being only 675 below that of Alabama, though its gain over 1914 was only 15 per cent, or 1757 cars and trucks. Its gain since 1911 totals 9234 motor vehicles.

With respect to the population, Florida's registration makes the best showing of the group, there being only sixty-seven persons to each car or truck in use in the State.

Mississippi and Louisiana stand sixth and seventh, respectively, Mississippi registering 11,500 motor vehicles up to the end of 1915, and Louisiana having 10,880 on its lists. The number of people per car in these two States is unusual, as compared with other States in the country, Mississippi having 168 and Louisiana 167, so that they rank respectively second and fourth from the bottom of the list of the United States.

Security Prices Lower

General Motors Drops 16 Points — Maxwell and Studebaker Lower

NEW YORK CITY, March 7—A further decline in automobile security prices occurred last week. With the exception of a few issues, the majority showed declines. Those issues which equaled or passed under their low marks for 1916, have established new low marks for this year. General Motors is still quoting considerably ahead of its rock bottom price of 415, though it declined 16 points last week, reaching 460. Maxwell common, first preferred and second preferred all dropped. Its common has reached 59, a drop of 9 points in two weeks. The second preferred, which showed a little strength recently has joined the general decline with a 4-point drop.

Chevrolet, Packard and Willys-Overland were the features of the automobile issues with rises of 3½, 5 and 7 points respectively. Chevrolet has shown considerable strength on the report of $6,000,000 earnings for 1916. It is stated that the company will turn out 20 per cent more cars than were projected for 1917 at the time of public financing last fall.

Goodrich common went up 1¼ points, reaching 70¼. This company is stated to have a large quantity of crude rubber on hand which cost it under 60 cents per lb. The sales of this company in January increased 150 per cent over January a year ago.

Though the declines last week were frequent, they were, however, in the majority of cases small. Ajax Rubber dropped 2½ points to 68½; International Motors common and preferred declined 1 and 2 points; Kelly-Springfield new common went down to 67; New Departure common went down 2 points; Reo Truck and Car went down 1½ and ½ points; and Stewart-Warner common reached 84 at a decline of 2 points.

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Further Rise in Market Prices

NEW YORK CITY, March 8—Market prices last week took another jump. With an exceptional demand for spot delivery the market as a whole is very strong. Of the metals, copper is the only one which at the present time lacks demand. The resumption of trading at London has failed to stimulate the demand for that metal and prices have declined as a result. Both electrolytic and lake copper dropped 1 cent a pound to 27½. Aluminum, Bessemer and open-hearth steel, lead, and tin, are now quoting at higher prices than last week. Aluminum has reached the record mark of 61 cents a pound, while Bessemer and open-hearth steel prices were raised to new high marks of $37 and $38 respectively per ton. Lead is scarce and the market strong at $6.70 per 100 lb. A number of the companies are selling lead only in limited quantities to their customers.

Though there was no material change in the crude rubber situation last week, the market, however, was somewhat more active and a firmer tone developed.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Ajax Rubber Co. (new)	..	..	68½	69	—2½
Aluminum Castings pfd	98	100	..	..	..
J. I. Case pfd	76	85	85	87½	+1
Chalmers Motor Co. com	..	87	130	150	..
Chalmers Motor Co. pfd	90	..	99	101	..
Chevrolet Motor Co	..	..	140	142	+3½
Electric Storage Battery Co	..	..	62	63	..
Firestone Tire & Rubber Co. com	280	..	740	750	..
Firestone Tire & Rubber Co. pfd	108	109½	113	..	..
General Motors Co. com	92	93½	460	465	—16
General Motors Co. pfd	94½	96	112½	113¾	— ½
B. F. Goodrich Co. com	30½	31	70¼	70⅜	+1¼
B. F. Goodrich Co. pfd	97	98½	113¾	115	+ ¼
Goodyear Tire & Rubber Co. com	187	190	345	350	+3
Goodyear Tire & Rubber Co. pfd	102	103	116	117½	..
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co. com	..	..	19	22	—1
International Motor Co. pfd	..	..	30	40	—2
Kelly-Springfield Tire Co. com	130	140	..	..	..
Kelly-Springfield Tire Co. com. (new)	..	..	67	69	—3
Kelly-Springfield Tire Co. 1st pfd	83	84	95	98	..
Kelly-Springfield Tire Co. 2d pfd	120	125	..	..	..
Maxwell Motor Co. com	27¼	29	59	59½	—4
Maxwell Motor Co. 1st pfd	67¾	69	82¼	83½	—2¾
Maxwell Motor Co. 2d pfd	26	27¼	44	45	—4
Miller Rubber Co. com	155	160	225	240	..
Miller Rubber Co. pfd	101	103	113½	116	..
New Departure Mfg. Co. com	124	125	171	175	—2
New Departure Mfg. Co. pfd	105	107	110	..	..
Packard Motor Car Co. com	..	98	170	185	+5
Packard Motor Car Co. pfd	..	97½	102	†104	..
Paige-Detroit Motor Car	..	..	665	705	..
Peerless Motor & Truck Corp	..	..	27	28	+1
Portage Rubber Co. com	34	36	68	71	..
Portage Rubber Co. pfd	85	95	106	108	..
Regal Motor Co. pfd	..	..	13	16	..
*Reo Motor Truck Co	10¾	11¾	25	26½	—1½
*Reo Motor Car Co	26½	28	33	34	— ½
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	50	51½	84	86	—2
Stewart-Warner Speed. Corp. pfd	101½	..	108½	..	+ ½
Studebaker Corp. com	46½	47½	136½	137	—3½
Studebaker Corp. pfd	93	94	110	113	+1
Swinehart Tire & Rubber Co	73	75	88	89	..
Texas Co.	..	..	199½	201	—2½
U. S. Rubber Co. com	56¼	57	49¼	50	—1
U. S. Rubber Co. pfd	103	103½	107	107½	..
Vacuum Oil Co	180	183	223	230	—4
White Motor Co. (new)	..	..	47	48	—2
Willys-Overland Co. com	98½	100	216	220	+7
Willys-Overland Co. pfd	96½	99	..	..	..

Official Quotations of the Detroit Stock Exchange

ACTIVE STOCKS

	1915 Bid	1915 Asked	1916 Bid	1916 Asked
Chalmers Motor Co. com	..	84	140	148
Chalmers Motor Co. pfd	91½	93	97½	101
Continental Motor Co. com	..	190	..	31
Continental Motor Co. pfd	80	85	9½	10
Ford Motor Co. of Canada	500	..	..	385
General Motors Co. com	90	93	425	480
General Motors Co. pfd	94	96	111	114
Maxwell Motor Co. com	27	29	58	60½
Maxwell Motor Co. 1st pfd	66½	68½	80	85
Maxwell Motor Co. 2d pfd	25½	27	43	46
Packard Motor Car Co. com	..	..	170	175
Packard Motor Car Co. pfd	..	97½	..	104
Paige-Detroit Motor Car Co	..	..	675	700
*Reo Motor Car Co	27¼	28¼	33	34
*Reo Motor Truck Co	11	11¾	25	26
Studebaker Corp. com	46	47½	135	137½
Studebaker Corp. pfd	92	94½	107	..

INACTIVE STOCKS

*Atlas Drop Forge Co	..	25	33	..
Kelsey Wheel Co	195	..	435	..
*W. K. Prudden Co	19	20	..	33
Regal Motor Car Co. pfd	..	22	13	16

*Par value $10. †And accrued dividend.

Shipments are coming in regularly and the manufacturers are showing a better demand. Last week Para dropped 1 cent per pound to 77 cents, while Ceylon, first latex crepe remained constant at 94.

Gasoline has taken the long expected rise to 24 cents a gallon wholesale. A further rise is predicted. On top of the general rise in gasoline throughout the country comes the announcement of another rise in Pennsylvania crude oil to $2.50 per barrel. This new advance has been expected and it is thought that it will bring out the hoarded supply of crude held for the account of producers, in tanks and pipe lines. It is stated, however, that there is no hope that this increased supply will have any material effect on the present scale of gasoline prices.

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N. Y. Gasoline Now 24 Cents a Gal. Wholesale

NEW YORK CITY, March 3—Automobile owners are now paying from 26 to 31 cents a gallon for their gasoline in this city. This fuel yesterday went up another cent in the wholesale market, reaching 24 cents. Consumers last year at this time of the year were paying from 14 to 17 cents a gallon.

Despite investigations on the part of Congress and the protests of the local trade associations, prices have continued to increase at the rate of about 1 cent a month.

Action will be taken by the leading trade associations in this State. It is stated that the New York Garage Assn., and the New York State Automobile Trade Assn., are preparing a combined attack on the stand taken by the oil producers.

The increase in the prices, it is explained, is on account of the increased demand for gasoline at practically any price by the warring nations for their trucks, cars and aircraft, the Mexican troubles, which stop the supply from that country, and the slide in the Panama Canal, adding to the cost of transportation from the California wells.

England Threatened by $1 Gasoline

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Agitation to Prevent Private Use of Automobiles Grows—Opposition is Very Strong

LONDON, ENGLAND, Feb. 18—The extinction of all private motoring in England is threatened by a recommendation of the National Organizing Committee for War Savings that pleasure motoring should not be indulged in. The Committee states that this is a selfish and thoughtless form of extravagance affecting (1) Ships and men now employed in carrying oil and rubber for automobiles and bicycles; (2) Men at docks and railroads, carmen, etc., employed in handling these cargoes and in work connected with the importation of automobiles and bicycles; (3) Chauffeurs now engaged in driving and looking after automobiles; (4) Men now engaged at garages and shops all over the country repairing automobiles and bicycles; (5) Men engaged in the manufacture and handling of tires used on automobiles.

At present the move is nothing more than a recommendation, but an endeavor is being made to put a stop to all pleasure motoring by reason of a special tax on gasoline. It is hinted that gasoline, which now costs 50 cents a gallon will be raised to $1. Many of the daily newspapers are clamoring for this measure in order to put a stop to what they claim is a useless extravagance. Much use is being made of the claim that pleasure motoring has been forbidden in France and should also be tabood in England. This is quite incorrect, for although nobody can use an automobile in France without a special police pass renewable monthly, this pass is given to everybody of recognized honorability irrespective of what kind of service the car may be intended to perform. The measure is only a precaution against the use of automobiles by spies, criminals or suspected persons.

English motorists are making a vigorous protest against the suggestion that cars are being used to any important extent for pleasure riding only. The high cost of gasoline, the impossibility of obtaining chauffeurs, the general money tightness, have all caused an important diminution in the number of cars in general service. It is difficult to say what is legitimate and what illegitimate motoring, or to devise a scheme which will allow gasoline to be used for the one and to prevent its use for the other. Practically all automobiles in service at the present time are utility vehicles and are used as such for 90 per cent of their mileage. If a remedy is sought by putting an additional tax on gasoline, it will hit hardest at men to whom a car is an absolute necessity. The suggested system of licenses is almost impossible of application, for it would be exceedingly difficult for any body of judges to say in which cases the use of an automobile was justified and in which it was not, or how much useful work must be done by the owner to justify him using the automobile on one occasion for either health or pleasure. In general motorists are of the opinion that the present high cost of gasoline has been quite sufficient to put a stop to all pleasure use of the automobile.

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Texas Trouble Now Settled

NEW YORK CITY, March 4—The several automobile manufacturing companies recently sued in Texas for a violation of the anti-trust law of that State, on the ground that they limited the territory of the dealer, as is common practice throughout the country, have agreed to accept consent injunctions. These injunctions prohibit them from limiting their dealers to definite territory so that the manufacturers are changing their contracts with the dealers to comply with the law. In doing this, however, the manufacturers feel that the dealers, as well as the general public, will not profit by the change since a man may buy a car of a dealer several hundred miles from his home but he cannot expect that the local agent of the same car will give him service on a car bought from another dealer. This is only one example of the disadvantages of the new arrangement, the general tendency being to relieve the dealer of all responsibility as to service, etc.

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U. S. Rubber Sales $92,861,015

NEW YORK CITY, March 8—Net Sales of the U. S. Rubber Co., for the year ended Dec. 31, 1915, amounted to $92,861,015, as against $83,678,812 in the preceding year. The net profits before deducting interest charges were $11,486,705, compared with $9,776,873 in 1914. The surplus was $2,882,048 against only $721,951 for the previous year.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Week's Ch'ge
Aluminum	.60	.61	.61	.61	.61	.61	+ .01
Antimony	.43¾	.43¾	.43¾	.43¾	.43¼	.43¼	...
Beams and Channels, 100 lb	2.42	2.42	2.42	2.42	2.42	2.42	...
Bessemer Steel, ton	35.00	35.00	35.00	37.00	37.00	37.00	+2.00
Copper, Elec., lb	.28½	.28	.28	.28	.28	.27½	— .01
Copper, Lake, lb	.28½	.28	.28	.28	.28	.27½	— .01
Cottonseed Oil, bbl	9.86	9.75	9.94	9.96	10.04	10.15	+ .29
Cyanide Potash, lb	.28	.28	.28	.28	.28	.28	...
Fish Oil, Menhaden, Brown	.53	.53	.53	.53	.53	.53	...
Gasoline, Auto, bbl	.23	.24	.24	.24	.24	.24	+ .01
Lard Oil, prime	.95	.95	.95	.95	.95	.95	...
Lead, 100 lb	6.50	6.50	6.50	6.60	6.60	6.70	+ .20
Linseed Oil	.77	.77	.77	.77	.77	.78	+ .01
Open-Hearth Steel, ton	38.00	38.00	38.00	38.00	38.00	38.00	...
Petroleum, bbl., Kansas, crude	1.30	1.30	1.30	1.30	1.30	1.30	...
Petroleum, bbl., Pennsylvania, crude	2.40	2.40	2.40	2.40	2.40	2.50	+ .10
Rapeseed Oil, refined	1.05	1.05	1.05	1.05	1.05	1.05	...
Rubber, Fine Up-River, Para	.78	.76	.76	.77	.76	.77	— .01
Rubber, Ceylon, First Latex Crepe	.94	.94	.94	.94	.93	.94	...
Sulphuric Acid, 60 Baume	2.00	2.00	2.00	2.00	2.00	2.00	...
Tin, 100 lb	47.75	47.50	47.00	46.26	46.25	49.00	+1.25
Tire Scrap	.06½	.06½	.06½	.06½	.06½	.06½	...

Colonel Colt announces that the sales of the United States Tire Co., for January and February showed a very large increase over the corresponding period of last year. The organization of the United States Tire Co. has recently been enlarged and strenghtened. In addition to the distribution of tires through the fifty-one branches of that company, provision has been made for a very much wide distribution through the stores of the U. S. Rubber Co. Colonel Colt added that at no time in the company's history had there been greater activity in its business than now. All the factories, he stated, were working at capacity and steps were being taken to enlarge several of the plants, one of them being the Morgan & Wright factory in Detroit. This work is well under way and when completed will double the capacity of that plant.

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Eighth Edition Used Car Report

CHICAGO, ILL., March 4—The eighth edition of the National Used Car Market Report of the Chicago Automobile Trade Association has been issued. In appearance and size it is exactly like its predecessors, the essential difference being in the figures given for the various cars listed. In the seventh edition the figures were given for sales made between June 21 and Sept. 21; the new edition gives figures for sales of used cars between Sept. 21 and Dec. 21. The number of cars listed shows but one change, the Mora failing to appear in the new book. The number of dealer associations and manufacturers supporting the movement also remains practically unchanged.

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Thomas Neal Joins Signal Truck

DETROIT, MICH., March 6—Following closely upon the announcement of the increase of the capital stock of the Signal Motor Truck Co., from $85,000 to $550,000, comes the further information that Thomas Neal, former president and chairman of the executive committee of the General Motors Co., has been made a director and elected chairman of the executive committee of the Signal company, but will retain his connection with the Acme White Lead & Color Works.

At the same time Mr. Thomas Neal was elected a director, Myron W. Neal, treasurer of the Acme White Lead & Color Works, Detroit, and W. K. Hoagland of Allerton, Greene & King, bankers in Chicago, were elected to the board of directors. The other members are A. C. Burch, John Squires and Murray Wendell.

The Signal company is to have a new plant on North Jefferson Avenue, near the plant of the Chalmers Motor Co. It is to be big enough to insure an increase of 300 per cent in its production as compared with that of the past year.

Studebaker Raises Some Prices

Small Increases Made on Prices of Passenger Cars—Trucks Unchanged

DETROIT, MICH., March 4— The Studebaker Corp. increased the price of five of its models on March 1. In the four-cylinder class the three-passenger roadster, formerly $825, is now listed at $850; the seven-passenger touring car, which was formerly listed at $845, now sells at $875; the landau-roadster, which was selling at $1,145, now sells at $1,150.

Of the six six-cylinder models, the price of two has been increased. The three-passenger roadster sells now at $1,060 instead of $1,025, and the seven-passenger touring car formerly listed at $1,050 now sells at $1,085. The price of the landau-roadster, $1,350; of the four-passenger coupe, $1,600; of the sedan, $1,675, and of the seven-passenger limousine, $2,500 remains the same. There is also no alteration in the price of the commercial car line, which was published in THE AUTOMOBILE, Feb. 24.

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National Gas Assn. to Discuss Tractors

CHICAGO, ILL., March 8—Plans are nearing completion for the annual convention of the National Gas Engine Assn., which will be held at the Sherman Hotel, Chicago, June 27, 28 and 29.

"Tractor and Tractor Engines" will be the subject of one session, during which there will be a number of papers, including "Tractor Engines" by W. J. McVicker of Minneapolis, as well as a paper on "Carburetion," "Traction" and "Tractor Equipment" by well-known authorities, and a general discussion of such matters.

The use of kerosene and "Design of Oil Engines" will be taken care of by Professor Norris of Wisconsin University.

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Detroit S. A. E. Meet March 17

DETROIT, MICH., March 4—The next meeting of the Detroit Section of the Society of Automobile Engineers will be held March 17, in the convention hall of the Hotel Ponchartrain. The speaker of the evening will be J. G. Perrin, chief engineer of the Timken-Detroit Axle Co., whose subject will be: "Evolution of the Rear Axle."

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$30,000 in Prizes for Chicago Derby June 10

CHICAGO, ILL., March 8—Cash prizes amounting to $30,000 have been offered for the International 300 mile race to be held at Speedway Park on June 10. The race is open to Class E non-stock cars of 300-cu. in. piston displacement or less, with a maximum weight of 2500 lb.

There will be ten prizes divided as follows: first, $12,000; second, $6,000; third, $3,000; fourth, $1,500; fifth, $1,300; sixth, $1,200; seventh, $1,100; eighth, $900; ninth, $800, and tenth, $700. The car leading at 100, 200 and 250 miles, will receive $500 for each distance.

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Timken Puts Up Seventh Building

DETROIT, March 6—The Timken-Detroit Axle Co. is now building a large addition which will be the seventh new building put up within the last year. This new structure will be known as the heat-treating plant and will cost approximately $300,000. It will be a three-story building 40 by 330 ft.

The heat-treating department will occupy the entire first floor while the upper floors will be used for manufacturing operations on the stock as it comes from the furnaces. There will be two specially-built rotary furnaces embodying in their design all the new scientific principles required for the heat-treatment of the many grades of steel used by the Timken company. There will be two large electric traveling cranes to handle the stock in the plant carrying it from furnace to furnace and from cooling vat to cooling vat.

The plant will be connected with the large new forge shop recently completed, by a tunnel which runs under the main building of the Timken plant. Through this tunnel, forgings will be brought to the heat-treating furnaces by electrical industrial trucks.

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To Develop New Universal

NEW YORK CITY, March 8—J. E. Gramlich, formerly engineer and superintendent of The Chase Motor Truck Co. of Syracuse, N. Y., has severed his connection with that company to become associated with the Thermoid Rubber Co. of Trenton, N. J. Mr. Gramlich will act as engineer for the latter company, giving his time exclusively to the development of the lately patented Thermoid-Hardy laminated disk, for which this company has the exclusive American rights.

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Fergus Motors Formed

ALBANY, N. Y., March 3—The Fergus Motors of America, Inc., was incorporated to-day to manufacture the Fergus car, shown in this country for the first time at the recent New York City automobile show. The capital stock of the company is $2,000,000 and the main offices are in East Chester, Westchester county. The directors of the company are C. T. B. Roew of Bronxville, Charles Blandy, Jr., New York City and F. F. Quantrell, Brooklyn.

Factory Miscellany

Canadian Crow to Add—The directors of the Canadian Crow-Elkhart Motor Co., Mount Brydges, Ont., is considering the enlargement of the plant.

Elgin to Build—The Elgin Motor Car Corp., Chicago, Ill., is having plans prepared for the erection of a $50,000 plant, 168 by 272 ft., at Argo, Ill.

Toronto Tire Co. to Enlarge—The Gutta Percha and Rubber Co.'s factory, Toronto, Ont., where Maltese Cross tires are manufactured, on West Lodge Avenue, will be enlarged.

Lane Truck to Build—The Lane Motor Truck Co., Kalamazoo, Mich., has taken temporary quarters in the Frank Burtt Building. A plant will be erected within the next two months.

Bour-Davis Buys Land—The Bour-Davis Motor Car Co., Detroit, Mich., has purchased a tract at Kercheval Avenue and the outer belt railroad, upon which to erect a factory.

Chevrolet Plant in Seattle—The Chevrolet Motor Co. has determined to establish an assembling plant in Seattle just as soon as the plant at San Francisco is completed. The Seattle factory will supply the entire Pacific Northwest.

Rock Island Top Co. Opens Plant—The Motor Row Top Co., Rock Island, Ill., making automobile tops, radiator covers, automobile upholstering and other special work, has opened a plant at 1818 Fourth Avenue. S. P. Pearson is general manager.

Bulkley-Rider to Build—The Bulkley-Rider Tractor Co., Los Angeles, Cal., has announced that as soon as a site can be decided upon, the company will begin the erection of a large factory with a capacity of twenty-five tractors per month. Plans for the factory have already been accepted and several sites are under consideration.

To Make Resilient Wheel—The Willson Resilient Auto Rim Co. will soon be organized at Columbus, Ohio, for the purpose of manufacturing a patented resilient rim, the invention of F. R. Willson, an electrical engineer at the Jeffrey Manufacturing Co. At a recent meeting of the stockholders F. R. Willson was elected president and H. H. Spain, secretary-treasurer.

To Make Tires in Baltimore—The Baltimore Rubber Tire Mfg. Co., Baltimore, Md., has been formed to make automobile tires. No plant as yet has been selected. The name of the tire will be Wil-Lox. The capital stock of the company is $200,000. The officers of the company are G. W. Habbersett, president; H. M. Rever, secretary-treasurer; A. S. Mauk, vice-president and general manager.

Timken Roller to Build in Canton—The Timken Roller Bearing Co. announces that a new addition, which will give employment to 200 men, will be built by the company on Deuber Avenue, Canton, Ohio. This announcement was made following action by the city council granting the company permission to use a portion of Nineteenth Street. When it was reported that the new addition would be erected at Detroit, where another branch of the company is located, the city council granted the permission desired.

Watertown Co. to Make Tractors—The John Dornfeld Co., Watertown, Wis., machine shop, structural iron, boiler and tank works, has entered into a contract with the Brillion Implement Mfg. Co., gasoline engines, Brillion, Wis., for the joint manufacture of a general utility farm tractor and truck. The Brillion company will manufacture the engines and the Watertown firm the chassis complete. The product will be distributed and marketed from Watertown. The tractor is a Brillion design and arranged for manifold purposes. About seventy-five men will be added to the Dornfeld payroll at once.

Janesville Workmen to Build Tractors—Union workingmen of Janesville, Wis., seeing the possibilities of the gas tractor business, have organized the Janesville Tractor & Engine Co., Janesville, Wis., to engage in the manufacture of a general utility tractor for agricultural purposes.

The Automobile Calendar

March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
March 8-11.....Davenport, Iowa, Show, Tri-City Davenport, Rock Island & Moline; Tri-City Automobile rade Association.
March 8-11.....Mason City, Iowa, Show, Armory.
March 8-15.....Brooklyn, N. Y., Show, Brooklyn Motor Dealers' Assn.
March 9-11.....Kenosha, Wis., Show, Kenosha Retail Assn., Kenosha Farmers' Session.
March 14-17.....Springfield, Ill., Show.
March 15-18.....Trenton, N. J., Show, Armory, under auspices of Chamber of Commerce.
March 18-25.....Pittsburgh, Pa., Twelfth Annual Show, Automobile Dealers' Assn., Motor Square Garden.
March 20-25.....Twin Falls, Idaho, Show, Oliver Tabernacle.
March 21-25.....Deadwood, S. D., Show, Auditorium. Deadwood Business Club.
March 22-25.....Lexington, Ky., Show, Woodland Auditorium.
March 25-April 1..Wheeling, W. Va., Show, Market Auditorium.
March 27-April 1..Danville, Ill., Show, Eastern Illinois Dealers.
March 27-April 1..Zanesville, Ohio, First Annual Southeastern Show, Airdome.
March 28-April 3..Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
April 1-8.....Butte, Mont., Home Industry Electric & Auto Show, Holland Arena, H. W. West, Mgr.
April 8.....Corona, Cal., Race.
April 10-15.....Seattle, Wash., Show, Arena.
April 15.....Altoona, Pa., Pennsylvania State Motor Federation.
Apr. 26-May 6....Oakland, Cal., First Annual Pacific Coast Motor Power & Automobile Show, Automobile Industries Assn.
May .....Chicago, Ill., Speedway Race for Amateurs, Speedway Park Assn.
May 6.....Sioux City, Ia., Speedway Race, Sioux City Speedway Assn.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 20.....Chicago Non-Professional Speedway Race, Western Interclub, Speedway Park.
May 26-27.....Del Monte, Cal., Meeting, Three Divisions of National Assn. of Automobile Accessory Jobbers.
May 30.....Tacoma, Wash., 100-Mile Speedway Race, Tacoma Speedway Assn.
May 30.....Indianapolis Speedway Race.
May 31.....Minneapolis, Minn., Speedway kace.
June 10.....Chicago Speedway Race. International 300 - Mile Race, Speedway Park, Speedway Park Assn.
June 28.....Des Moines, Iowa, Speedway Race.
July 2-6.....Detroit, Mich., World's Salesmanship Congress, Detroit Board of Commerce Bldg.
July 4.....Tacoma, Wash., Speedway Race, Tacoma Speedway Assn.
July 4.....Coeur D'Alene, Idaho, Race Meet, Hilles-Riegel.
July 4.....Minneapolis 300-Mile Speedway Race.
July 4.....Sioux City Speedway Race.
July 15.....Omaha, Neb., Speedway Race.
Aug. 5.....Tacoma Speedway Race, Tacoma Speedway Assn.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Speedway Race.
Sept. 4.....Indianapolis Speedway Race.
Sept. 16.....Providence Speedway Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Speedway Race.
Oct. 14.....Chicago Speedway Race.
Oct. 19.....Indianapolis, Ind., Race, Indianapolis Motor Speedway.

The Week in the Industry

Smith Goes to Edison—G. D. Smith, for the past two years supervisor of agencies for the General Vehicle Co., Inc., has been appointed special assistant to H. G. Thompson, vice-president and general sales manager, Edison Storage Battery Co. Mr. Smith will make his headquarters at the factory and main office, Orange, N. J.

Hupp Appoints New District Managers J. G. Painter and W. J. Walker have been appointed district managers by the Hupp Motor Car Corp., Detroit. Mr. Painter has had charge of the technical service department at the Hupp factory. He will have charge of the important territory of Ohio, Michigan, Northern Indiana and a portion of West Virginia. Mr. Walker, with headquarters in Winnipeg, will cover Alberta, Manitoba, Saskatchewan and Western Ontario.

Dealers

Wis. News Items—W. L. McLaughlin, Algoma, Wis., operating under the name of Algoma Tire Repair Co., opened a vulcanizing and tire store at Steele and Fourth Streets on March 1.

Schueler Bros., 247-249 Milwaukee Street, Milwaukee, operating a large painting and trimming shop, have been appointed distributers of Hood and Puritan tires for the State of Wisconsin.

The K. W. Battery Co., Milwaukee, has established a factory and repair shop for storage batteries at 1702 North Avenue, Milwaukee. The firm is composed of F. Kruschka, president; C. Jurss, secretary, and C. Weidler, treasurer. The company will manufacture batteries as well as rebuild and repair cells. An elaborate recharging outfit has been installed.

Harry Newman, Inc., 701-707 Grand Avenue, Milwaukee, distributer of the Chalmers in Wisconsin, upper Michigan and adjacent territory, announces the addition of two former Studebaker men to his Milwaukee staff, viz.: H. H. Batcheller, formerly of the Chicago Studebaker branch, and L. S. DeLand, since 1910 sales manager of the Studebaker for Wisconsin in Milwaukee. Both men will travel through the Newman territory and co-operate with Chalmers dealers.

The Wisconsin Aluminum Foundry Co., Sixteenth and Franklin Streets, Manitowoc, Wis., is having plans prepared for a 75 by 145 ft. addition, to be used for foundry and machine shop purposes. The present plant was erected only three years. The business for 1915 showed an increase of more than 50 per cent.

Motor Men in New Roles

New Men for Vim Truck—The Vim Motor Truck Co., Philadelphia, Pa., has added T. E. Cathcart, W. L. Kroneberger and Howard Hewitt to its force. Mr. Cathcart was formerly with the standard Roller Bearing Co. in charge of sales. Mr. Kroneberger was with the Curtis Publishing Co. in its circulation department and Mr. Hewitt was factory service manager of the Morgan Dean Rapley Co., Hamilton, Ont.

Daniels Heads Springfield Chalmers—The Chalmers Motor Co. of Illinois has leased the building at 408-412 East Monroe Street, Springfield, Ill., and makes this the distributing center for central Illinois. H. B. Daniels has been engaged as resident sales manager and will have a staff of assistants. The plant just leased will be enlarged and improved for sales and storage purposes.

Chapman Resigns—H. O. Chapman, in charge of the Packard agency at Dubuque, Iowa, has resigned to become sales manager for the L. J. Theiss Co., Rockford, Ill.

Duggan Takes on Dort—The Dort distributing agency for Colorado and adjacent territory is now in charge of George A. Duggan, located temporarily at 1528 Broadway, Denver. C. Mark Hanna, formerly associated with him, is his sales manager.

Johnson Returns to Toronto—D. F. Johnson, former Canadian and European agent of the Stewart-Warner Speedometer Corp., has returned to Toronto from San Francisco, where he had charge of the coast business of the company. The company will establish service stations throughout Canada and has appointed Johnson director and sole Canadian distributor of the Stewart-Warner products. The head office of the chain of service stations will be the Toronto depot at 486 Yonge Street.

Allen Goes to Detroit—C. M. Allen has left for Detroit in the interest of promoting the sale of the Heath carbureter, manufactured by the M. K. Bowman-Edson Co., New York City.

Pollock Detroit Rep.—P. J. Pollock has been appointed a sales representative of the Detroiter Motor Car Co., Detroit, Mich. He will travel through Ohio.

Ranney Columbus Firestone Sales Mgr.—G. E. Ranney, formerly of the Chicago branch, has been made manager of the Columbus branch of the Firestone Tire & Rubber Co., to fill the vacancy caused by the promotion of G. E. Richards to the management of the Pittsburgh branch.

Sehl Joins Studebaker—J. P. Sehl, who was commercial body designer of the Pierce-Arrow Motor Car Co., Buffalo, is now a member of the body-designing department of the Studebaker Corp., Detroit, Mich.

Shafer Takes Standard in Los Angeles—C. C. Shafer has been appointed southern California and Arizona distributer of the Standard "8" line with headquarters in Los Angeles. The agency is housed at Eleventh and Olive Streets recently vacated by the Goodrich branch which is now in the seven-story Goodrich building on South Broadway.

Dealers

Burd Opens New Offices—The Burd High Compression Ring Co., Rockford, Ill., announces the opening of two additional sales offices during the past week. E. C. Fish was appointed manager of the new Rochester office, which is located at 558 Lyell Avenue, and the new Pittsburg office will be under the management of E. J. McClees at 904 East End Trust Bldg. H. F. Belcher, who has been working out of the Chicago office of the company for some time, has been transferred to the Peoria, Ill., territory. L. G. Rasmussen, for a number of years with the Woods Vehicle Co., has joined the selling organization of the Burd company, and will be attached to the Chicago office, covering the Northern Illinois territory outside of Cook County.

Denver News Items—The Chandler Auto Co. is the name of a new Colorado distributing agency for the Chandler just opened at 1518 Broadway, Denver.

Mulnix & Rarie, Colorado and Wyoming distributors for the Grant, have bought out the Pathfinder distributing agency from the Charles F. Cole Corp. and moved from 17 East Colfax Avenue, Denver, into the Cole quarters at East Colfax Avenue and Lincoln Street.

The J. S. Morrison Auto Co., 1528 Broadway, Denver, has turned over the Dort to another distributing agent and is now handling the Oakland exclusively.

The Federal Rubber Mfg. Co. has discontinued its Denver branch, and arrangements have been completed with the Federal Rubber Tire Works Co., a Denver concern, to act as Federal distributor for Colorado and adjacent territory. The president of the new distributing firm is E. R. Cumbe.